Chemical Industries

JUNE 1950

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Cover: Fabricating ribbon mixer blade

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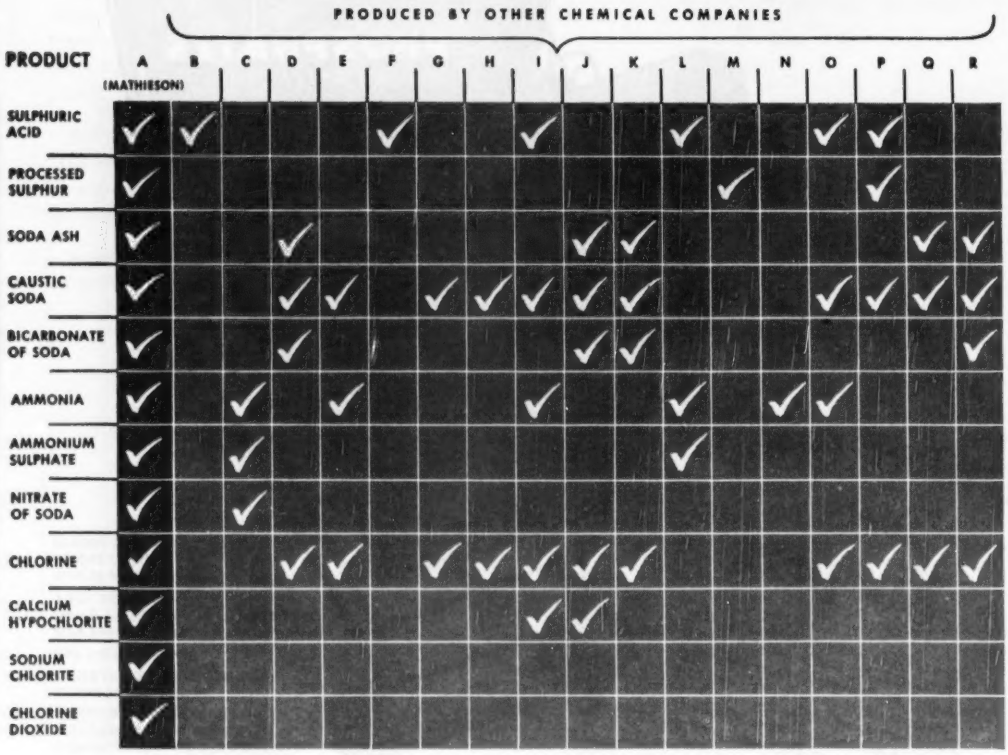

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Chemical Industries

Including CHEMICAL SPECIALTIES

Vol. 66, No. 6

JUNE 1950

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

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THE READER WRITES

Ammonia Calculations

To the Editor of Chemical Industries:

In your article on synthetic ammonia in the issue of July, 1949, there appear to be two mistakes in arithmetic in the computation of the estimated cost of manufacture.

First, where natural gas is used as a raw material, the sum of operating cost, insurance and taxes, and depreciation should be $35.47 not $45.47 as reported. This is not a typographical error, as the remaining calculations are based on this incorrect figure.

I am not quite sure of the second error, since my method of computation may be wrong. However, the working capital is reported as being based on 15 per cent of gross sales, or $1,200. According to my calculations, this figure should be $3,290, based on sales price of $75 a ton and 80% capacity operation.

FREDRIC A. OBSTFELD
Cornell University, Ithaca, N. Y.

Mr. Obstfeld is correct on both counts. Fortunately the first error was detected in time to make a correction on the reprints of the article. The second was not discovered until later, and in fact appears again in the calculation of return on investment.

The correct investment return figures are $24.60 and $28.22 for gas- and coke-derived ammonia respectively. Readers who have filed either the original article or the reprint may wish to make these corrections on their copies.—ED.

Who Said Shortage?

To the Editor of Chemical Industries:

I certainly can't agree with your May editorial to the effect that there is a shortage of managerial talent in the chemical industry.

I graduated as a chemical engineer in 1939, went to work with a medium-sized chemical company, spent four years in the Navy, and returned to my company in 1945. I have had the privilege of associating with a number of the younger men in the chemical industry, and there are many of them who, in my opinion, would make fine managers. Most of these men also happen to be good chemists or engineers. I have noticed that when a man is a good technologist, those above him often seem to take the attitude that he is doing a swell job where he is, so why upset things by moving him or diluting his efforts with managerial tasks.

What is so bad anyway about a technical education as a foundation for management responsibilities in the chemical industry? Certainly our industry is becoming more dependent on technical advances every day, and major management decisions are being based more and more on the technical facts in the situation. Certainly a man with a sound technical understanding is in a better position to judge the course a company should follow in a highly technical industry than is one without that understanding. In the legal profession, a man must know the law before he can become a judge.

I believe the chemical industry has been fortunate in attracting some of the outstanding talent among our young men of today. If chemical companies can't find enough future executives among the men in their present younger ranks, I suggest they get some new spectacles and take another look. I recall reading that the Du Pont Company early in this century was almost sold to a competitor because the incumbent management could see no able hands coming along to take over the reins.

(NAME WATHHELD ON REQUEST)

Groom Promising Men Early

To the Editor of Chemical Industries:

You hit the nail on the head in your May editorial "This Shortage Can Be Licked."

Chemical industry management has got to realize that a continuation of the present rate of expansion in chemical production is going to place serious drains on available managerial talent for some time to come. The only way it is going to be able to meet the situation is to start now to groom promising younger men for future executive posts.

The time is past when a company can wait until a vice president dies or retires and then go out and pick a likely successor from the ranks. The picking must be done in advance and the special educational process started early.

J. W. PARKINSON
New York, N. Y.

Styrene Addenda

Last month CI (p. 661) stated that the styrene plant of Carbide and Carbon Chemicals Division of Union Carbide and Carbon Corp., at Institute, W. Va. was no longer operating. This plant was shut down at the war's end but is again operating.

At the time the plant was constructed design capacity was 50 million pounds of styrene monomer per year.

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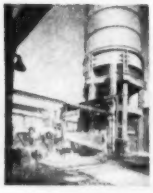

Quicklime silo and lime slakers in ethylene oxide and glycol unit at Jefferson's Neches plant.

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Briefs

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Caprylic acid esters useful as plasticizers for vinyl acetal resins can be prepared by reacting 300 g. of caprylic acid with 100 g. of diethylene glycol at 270°C.

A saturated polyester has been prepared by reacting one mol of a saturated dicarboxylic acid, such as adipic acid, with approximately one mol of a saturated dihydric alcohol, such as diethylene glycol, in the presence of an esterification catalyst while continuously removing water of condensation. Such an ester can be converted to an unsaturated resin by heating, and subsequently set up to a rubberlike product by further heating in the presence of an organic peroxide catalyst.

Natural gas dew point depressions of as much as 60° F. have been reported using concentrated diethylene glycol as a dehydrating agent without refrigeration. The agent is not corrosive and has a low freezing point, so that there is no possibility of solidification of the solution in the pipe line system.

These briefs are abstracted from recent publication or U. S. Patent Office reports. These uses may suggest other applications of Jefferson Diethylene Glycol in your products or processes. Send for sample and further information.

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Iodine Value (Wijs)	0.8
Neutralization Value	385.0
Color...Water White	Odor...Characteristic

Typical Composition

Caprylic Acid	90.0%
Caproic Acid	3.0%
Capric Acid	7.0%

Neo-Fat 9 (Capric Acid)

Mean Molecular Weight	173.3
Titer	30.0°C.
Iodine Value (Wijs)	1.2
Neutralization Value	323.7
Color...White	Odor...Characteristic

Typical Composition

Capric Acid	90.0%
Lauric Acid	7.0%
Caprylic Acid	3.0%

Neo-Fat 11 (Lauric Acid)

Mean Molecular Weight	203.0
Titer	37.8°C.
Iodine Value (Wijs)	1.0
Neutralization Value	276.0
Color...White	Odor...Trace

Typical Composition

Lauric Acid	90.0%
Myristic Acid	9.0%
Unsaturated Acids	1.0%
Capric Acid	Trace

Neo-Fat 13 (Myristic Acid)

Mean Molecular Weight	226.0
Titer	37.8°C.
Iodine Value (Wijs)	2.0
Neutralization Value	248.0
Color...White	Odor...Characteristic

Typical Composition

Myristic Acid	90.0%
Lauric Acid	4.0%
Palmitic Acid	4.0%
Unsaturated Acids	2.0%

Neo-Fat 1-56 (Palmitic Acid)

Mean Molecular Weight	258.0
Titer	56.0°C.
Iodine Value (Wijs)	3.0
Neutralization Value	216.0
Color...White	Odor...Trace

Typical Composition

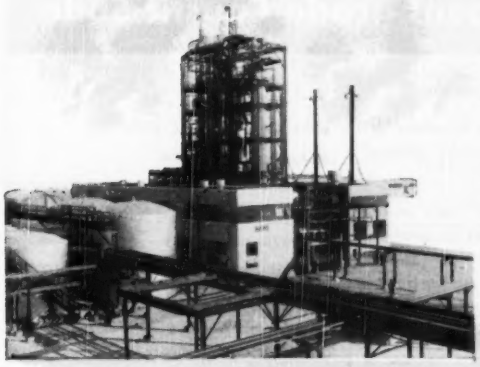
Palmitic Acid	90.0%
Oleic Acid	4.0%
Stearic Acid	6.0%

Neo-Fat 1-65 Stearic Acid

Mean Molecular Weight	282.5
Titer	67.0°C.
Iodine Value (Wijs)	3.0
Neutralization Value	198.0
Color...White	Odor...Trace

Typical Composition

Stearic Acid	90.0%
Palmitic Acid	6.0%
Oleic Acid	4.0%



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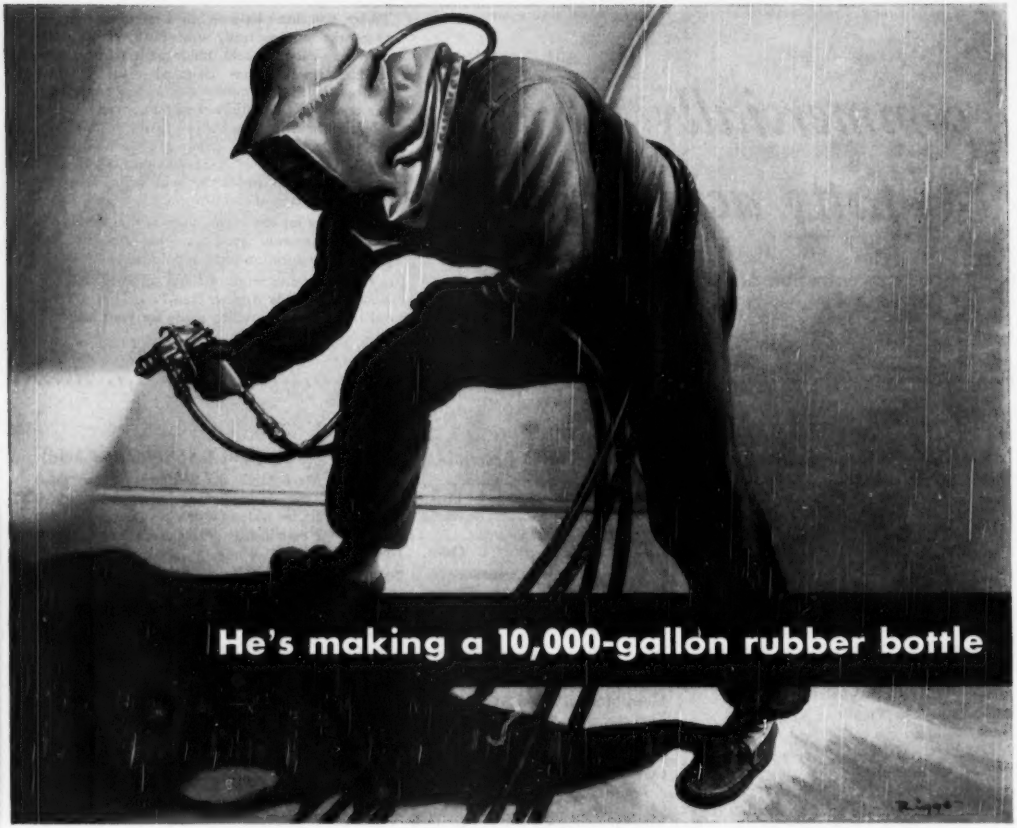

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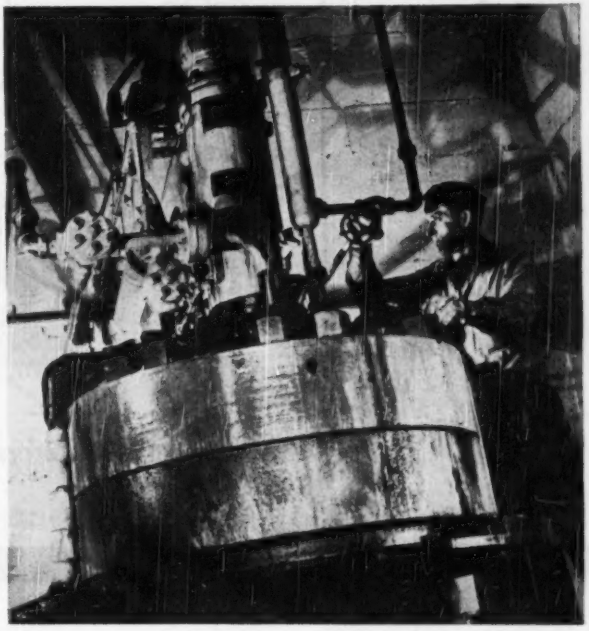

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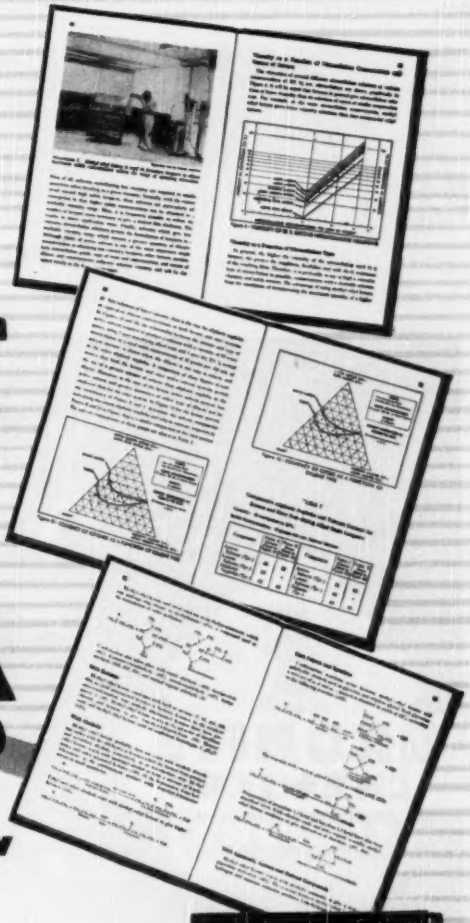

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10 important uses for

Oronite Polybutenes

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4. **BODYING AGENTS.** Oronite Polybutenes are very advantageous where formulations require hydrocarbon polymers. Wide viscosity range permits the right degree of bodying. They can be compounded with resins, waxes, oils and fatty acid salts.

5. **WATERPROOFING.** For the formulation of waterproofing coatings with waxes, resins, fatty acid salts, etc., they contribute good moisture resistance, better adhesion and flexibility; reduce cracking and chipping.

6. **PLASTICIZERS AND SOFTENERS.** As plasticizers and tackifiers for rubber and other elastomers and as softeners in leather treatments. Both emulsion and liquid forms of Oronite Polybutenes can be advantageously used.

7. **INSECTICIDES.** For moisture-resistant formulations, compositions which require high resistance to weathering, an excellent carrier of inert filler in paste formulations and tackifier.

8. **INKS.** In the formulation of paste inks and cartridge inks, Oronite Polybutenes have excellent pigment-carrying properties and can be compounded with fatty acids, oils and soaps.

9. **CAULKING AND SEALING COMPOUNDS.** Oronite Polybutenes are soluble in both raw and boiled linseed oil. Their pigment-carrying and non-drying characteristics make them extremely valuable for this use.

10. **AIR FILTERS.** Oronite Polybutenes of differing viscosities are efficient dust-collecting mediums in various makes of air filters.

Oronite Polybutenes are available in different viscosities to answer your specific problems.

Investigate Oronite Polybutenes now! Contact your nearest Oronite office for complete information and recommendations.

ORONITE CHEMICAL COMPANY

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STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
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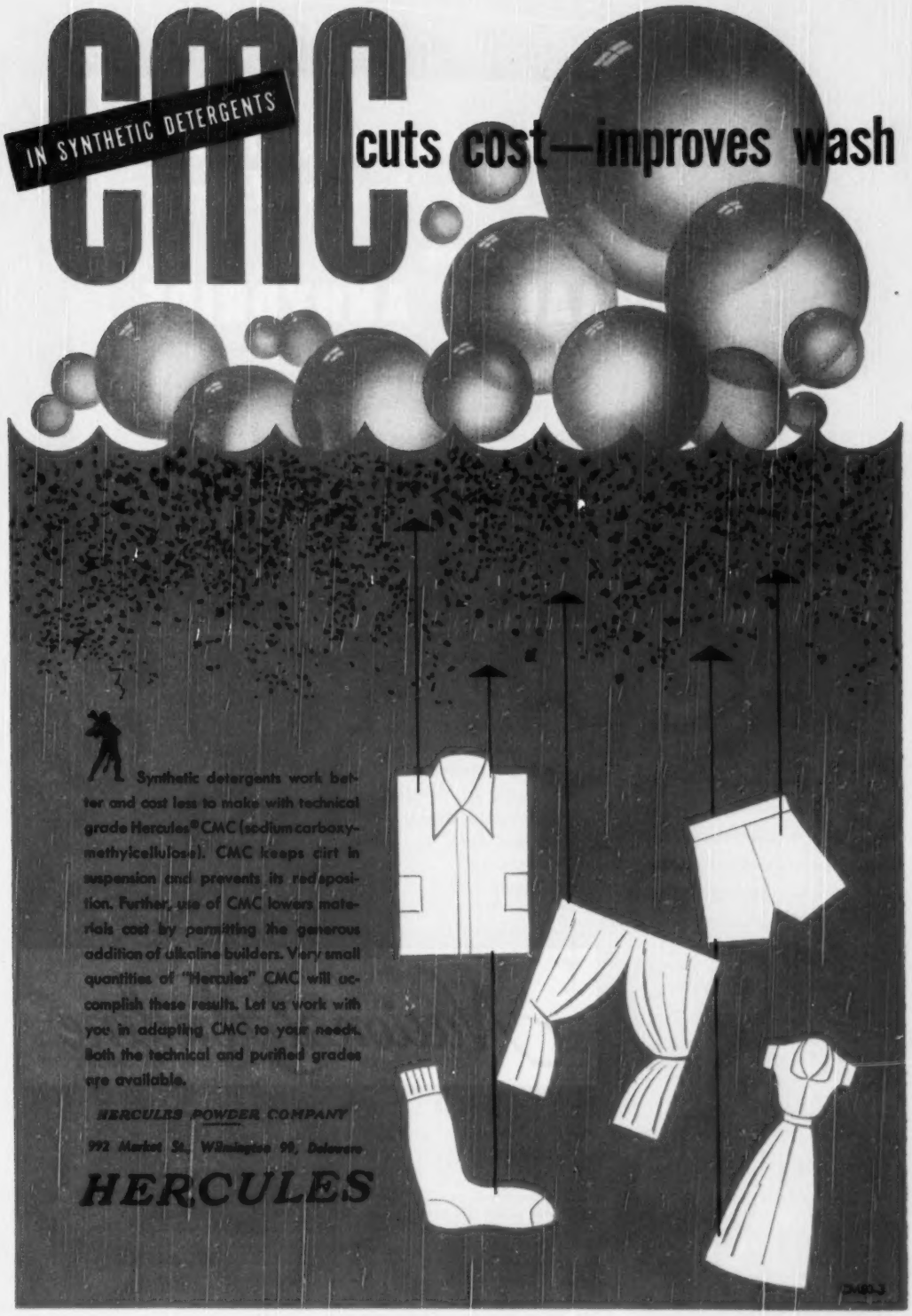
400 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
824 WHITNEY BUILDING, NEW ORLEANS 12, LA.

8856

CMC IN SYNTHETIC DETERGENTS cuts cost—improves wash



Synthetic detergents work better and cost less to make with technical grade Hercules® CMC (sodium carboxymethylcellulose). CMC keeps dirt in suspension and prevents its redeposition. Further, use of CMC lowers materials cost by permitting the generous addition of alkaline builders. Very small quantities of "Hercules" CMC will accomplish these results. Let us work with you in adapting CMC to your needs. Both the technical and purified grades are available.

HERCULES POWDER COMPANY
992 Market St., Wilmington 99, Delaware

HERCULES

Interesting possibilities for New Resins & Esters

based on

MALEIC ANHYDRIDE

Esters of Maleic Anhydride with unsaturated alcohols present exceptional possibilities for the creation of new resinous compounds. Their high degree of unsaturation — in both the acid and alcohol groups — makes them rapid polymerizers whose potentialities hold great promise.

As America's leading producer of Maleic Anhydride, we confine our activities to supplying resin manufacturers with uniform, dependable basic ingredients. We will, however, welcome inquiries for technical data and samples that may develop wider applications for National Organic Chemicals.

MALEIC ANHYDRIDE "RODS"
safer and easier to handle, less hydration, lower costs
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BHC

BENZENE HEXACHLORIDE

QUALITY YOU CAN COUNT ON . . .

STAUFFER has long been known primarily as a heavy chemical manufacturer, but in addition to its high position in industrial chemicals, Stauffer makes a long list of Agricultural Chemicals, including Benzene Hexachloride.

You can be sure when you buy Stauffer BHC formulations. Certain that Stauffer BHC has passed rigid laboratory tests and extensive field trials at the Stauffer Agricultural Research Laboratory, Mountain View, California.

This laboratory does the initial screening on all new Stauffer insecticides, fungicides, herbicides and soil fumigants. Only those products showing exceptional promise in this preliminary screening are released to experiment stations for use in their pest control investigations.

Remember when you buy Stauffer BHC and other agricultural chemicals that they all have been "Tested and Proved" by Stauffer Research.

OTHER STAUFFER PRODUCTS

BHC (Benzene Hexachloride)
Borax
Boric Acid
Boron Trichloride
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Carbon Tetrachloride
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Chlorine
Citric Acid
DDT (Dichloro Diphenyl Trichloroethane)
Lindane
Silicon Tetrachloride
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Sulphuric Acid
Tartaric Acid
Textile Stripper
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Stauffer

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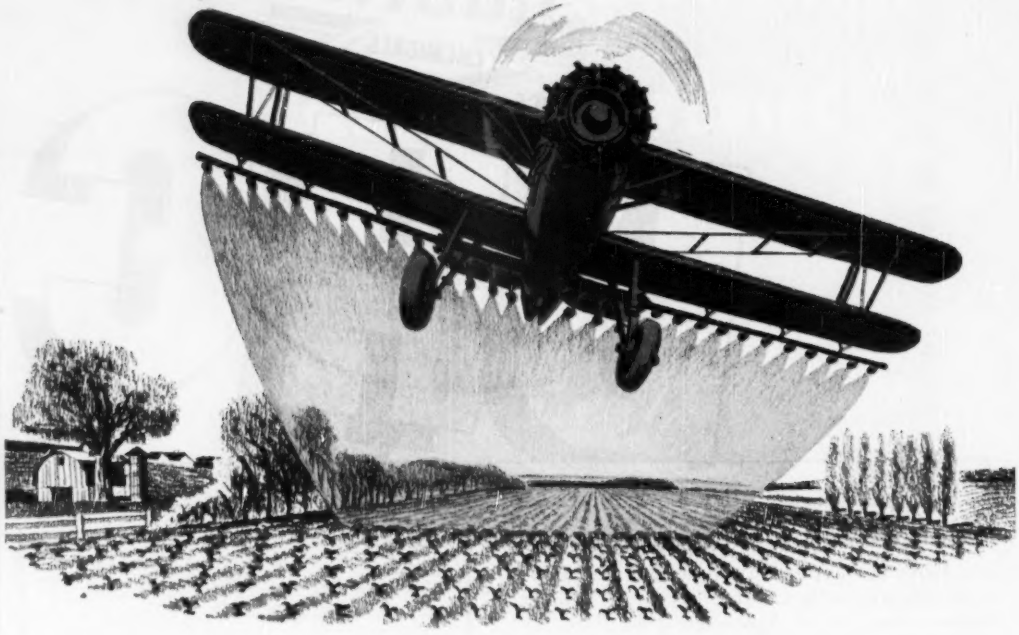
Ready for the "weed blitz!"



with *more* Pittsburgh 2,4-D

Last year, 2,4-D was applied to nearly 25 million acres in the "cereal crop belt!" 1950 promises even greater application. And to the 3 million acres sprayed by plane alone, last year, will be added the planned attack on the oak and mesquite brush country of the west and southwest.

Pittsburgh is ready with *more* 2,4-D to meet the constantly growing demands of the weed blitz! Our increased production, blending and storage facilities now more than *double* capacity to serve you.

Pittsburgh 2,4-D is available in acid, ester concentrates, and amine concentrates stabilized with Iminol-D for every application purpose.

OTHER "PITTSBURGH" CHEMICALS

Alkyl Methyl Pyridinium Chloride
Alphanitronaphthalene
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Phenol
Hydrochloric Acid—20° and 22°
Picoline—Alpha, Beta and Gamma
Pyridine—Medicinal and Industrial
Sodium Cyanide
Sodium Thiocyanate
Sulphate of Ammonia
Sulphuric Acid—60°, 66° and Oleum
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Tar—Crude and Road
Toluol—Nitration and Commercial
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2,4 Dichlorophenol
Plasticizers

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U.S.I. CHEMICAL NEWS

June ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1950

Hydrocarbon Synthesis Source of Acetaldehyde And Propionaldehyde

Compounds Are Important Raw Materials for Syntheses

The hydrocarbon synthesis will soon provide a new source of two members of the chemically active aldehyde series, acetaldehyde and propionaldehyde. These compounds are important intermediates in countless chemical syntheses. The two aldehydes will be available from U.S.I. shortly after plant operations are initiated.

An extremely volatile, colorless liquid with a strong, penetrating odor, acetaldehyde is widely used as a chemical raw material in the production of other organic chemicals. It is used in the manufacture of pentaerythritol, a polyhydric alcohol important in the production of alkyd resins, and in making the resin, polyvinyl acetal.

Currently, the largest use of acetaldehyde is to produce acetic acid by catalytic oxidation. The U.S.I. acetaldehyde to come from the synthesis will be carefully separated from a water solution and subsequently purified to most rigid quality specifications.

Propionaldehyde has physical properties between those of acetaldehyde and butyraldehyde. The reactivity of the aldehyde group and the ready replacement of the alpha hydrogen makes it of wide use in chemical syn-

MORE

Wetting, Penetration Of Surface-Active Agents Measured by New Method

A new method has reportedly been devised to determine comparative wetting and penetrating qualities of surface-active agents. The new technique involves adding a definite volume of surface-active agent solution to the most porous of a series of five stainless steel filtering crucibles having sintered, stainless steel filtering elements of varying porosities. A record is made of the time in seconds required to deliver the first drop and the first milliliter of solution. Based on the time for delivery under each category, a rating is given and the comparative wetting and penetration of each surface-active agent studied are evaluated, according to the scientists who developed the new technique.

The same method is said to be applicable for copper, bronze, medium steel, glass, canvas, cloth, and other textile materials; it reportedly can also be used in research on metal cleaning problems.

New Book on Safe Handling Of Radioactive Isotopes

A new 30-page booklet on safe handling of radioactive isotopes, conveniently subdivided for ready reference, is said to include tabulations of properties of the principal isotopes.

U.S.I. Launches 1950 Program For Truck-Crop Insect Control

On-the-Job Tests in 1949 Proved U.S.I.'s CPR Dust Base Is Faster, More Versatile, Longer Lasting than Rotenone

In 1949 American truck farmers, who use over a billion pounds of insecticides each year, found a new, powerful ally in their war against crop insects — U.S.I.'s CPR Dust Base. This combination of piperonyl cyclonene, pyrethrins, and rotenone was thoroughly field-proved last year and test results show that CPR:

1. Proved effective against a wide variety of insects, including certain destructive insects against which rotenone alone is not too effective, such as the green clover worm, the diamond back moth and the imported cabbage worm;
2. Demonstrated a killing potency six times faster than rotenone itself, with CPR effecting a kill in 12 hours and rotenone in 72 hours against the same insects;
3. Indicated a more effective residual power, with CPR lasting from 5 to 6 days, and rotenone from 2 to 3 days, under field conditions.

In 1949, their first season of commercial use, CPR-based insecticides proved they have the versatility needed for all-around, all-season truck-crop insect control.

Prevents Toxic-Residue Hazards

CPR Dust Base was introduced by U. S. Industrial Chemicals because of the apparent need of an insecticide that combined low toxicity with effectiveness. Growers can use CPR-based insecticides right up to and during harvest. No special processes are needed to remove deposits from CPR-treated crops. The washings ordinarily given to fresh vegetables before canning or packing are sufficient, because CPR leaves no toxic residues.

Nation-wide Tests

Last year's investigations of CPR dusts had the cooperation of 31 federal and state-supported institutions and 15 actual or potential customers in tests on insects destructive to small fruits, vegetable crops, and ornamentals.

MORE

Two New Free Booklets on Farm Insect Control

Tips on economical insect control — on the dairy farm and on the truck farm — are contained in two new free booklets available now from U.S.I. "Controlling Insects on the Dairy Farm" presents important data on Pyrenones* and includes frank discussions of: the dollar side of insect control; choosing an insecticide; how to apply insecticides; how to avoid toxic hazards and contamination of milk; and effectiveness and range of control.

The new, informative booklet on truck-crop insect control, "CPR," presents data on the impressive results achieved in actual on-the-job tests of CPR conducted during 1949. It also contains important information on just what insects CPR controls and how CPR prevents the hazard of toxic residues. For free copies, write the Editor, *U.S.I. Chemical News.*

*Reg. U.S. Pat. Off.

Methionine-Supplemented Soybean Meal Is Found Equivalent to Egg Protein

Recent work at a leading eastern university has shown that the protein of soybean meal has a biological value equal to that of whole egg protein when supplemented with methionine. The addition of approximately 0.2 percent methionine to soybean meal resulted in a protein which was retained as effectively by the animal as whole egg protein. The addition of whole egg to the ration containing soybean meal and methionine did not further enhance the value of the protein in the experimental rations. The work was carried out on hogs using a diet made up of 10% protein derived entirely from soybean meal.

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June ★ **U.S.I. CHEMICAL NEWS** ★ 1950

CONTINUED *Insect Control*

The dust was used in practically all sections of the country, both commercially and experimentally, throughout the year. The positive results against a wide range of insect life are sufficiently conclusive to regard CPR Dust Base Materials as ideal general purpose insecticides for use in the vegetable, small fruit, and ornamental field.

CPR-based insecticides were shown to be particularly outstanding against the principal

This is what happens to healthy bean plants when Mexican bean beetles move in. Once an infestation reaches the pupae stage shown above, the damage is done. A treatment with CPR when beetles first appeared could have prevented it.

insects affecting beans, including the Mexican bean beetle, the bean leaf beetle, the green clover worm and bean thrips — also against worms and loopers on cruciferous crops, flea beetles, blister beetles and many other leaf-eating insects. Other recommendations for CPR formulations, made possible by reported observations, include onion thrips, corn-ear worm, diamond back moth, melon worm, pickle worm, squash vine borer, omnivorous leaf tier, lygus campestris, asparagus beetle, webworm, and box-elder bug, the latter an ornamental pest.

Uses Superheated Steam In Spray Painting

Recent research experiments indicate use of superheated steam in spray painting instead of compressed air has these advantages: one pass application for 2 mils of film, and increased efficiency (less overspray). Boiler employed in the experiments is described as self-regulating and free of flame or fire hazards and all low-water danger. It is said to have no coils or tubes to burn out, scale, or to need replacing.

CONTINUED *Aldehydes*

thesis. Propionaldehyde condenses with itself to form an aldol which may be dehydrated and hydrogenated to yield 2-methyl pentanol, a hexyl alcohol of promise in the manufacture of plasticizers. With formaldehyde, propionaldehyde condenses to form pentaglycerol, a trihydroxy alcohol superior to glycerine and pentaerythritol for some uses. Polyvinyl propional resins have properties similar to polyvinyl acetal but better adapted to some applications.

Propionaldehyde may be used to modify thermosetting resins for which other aldehydes are raw materials. It may be oxidized to propionic acid or hydrogenated to n-propyl alcohol. Condensation with amines produces rubber accelerators. Reactivity of the material makes possible the synthesis of materials of interest to the pharmaceutical industry.

Specifications

Propionaldehyde Content by wt. ...	96.0% min.
Specific Gravity 20/20°C. (in air)...	0.803 to 0.809
Color (ASTM D-268)	Water White
Acidity, % by wt. as propionic	0.5% max.
Distillation Range	4°C., incl. 47.9
Non-volatile matter, gm/100 cc., Max.	0.005
Heavy Metals, % by wt., Max. .... (Calc. as Iron)	0.005
Odor	Characteristic

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new-type container for packaging toiletries, deodorants, medicinal and household creams and waxes, reportedly combines features of the collapsible tube and the "hard-covered" container. A twist of the bottom of the container is said to force ingredients up and out, leaving the cylinder intact. Tube may be readily emptied and exact amounts required can be delivered each time, the makers state. **(No. 569)**

An electric motor run continuously on a small flashlight battery, 1⅛" high by 1⅝" wide, has a speed of approximately 10,000 rpm on a 3-volt battery, the manufacturers claim. **(No. 570)**

A new washable non-skid floor coating for walk-in deep-freezes and refrigerators, slaughter houses, hotel kitchens, and hospitals, is said to be unaffected by fruit juices, butter, milk, and blood. **(No. 571)**

To restrain oxidation of soaps and resulting rancidity and discoloration, an amino compound which can be employed in either soda or potash soaps is available. It is said not to impart odor or color to soaps or to affect their efficiencies. **(No. 572)**

To simplify spray painting and permit control of "spray pattern" width from slightly more than an inch to over 12 inches, a new spray gun with a controllable nozzle and 4-finger trigger is on the market. **(No. 573)**

An automatic pipette for safe, accurate, convenient dispensing of liquids used routinely in small quantities, will handle volumes up to 2.0 ml., it is claimed. An adept operator can use the pipette 20 to 30 times per minute, according to the makers. **(No. 574)**

A new stopper and unloading device for emergency use on tank cars, said to stop wild flow as soon as it is put in place, permits unloading of contents without necessity of unloading overhead. **(No. 575)**

An aluminum foil-backed wrapping paper for vaportight packaging of new and spare parts is described as waterproof, scuffproof, and resistant to oils, greases, mild alkalies and acids. **(No. 576)**

For imparting fire-retardant properties to all types of cellulosic fabrics, a new low-cost chemical composition is reported available. **(No. 577)**

Viscosity measurements directly in centipoise units without need for calculations are reported possible with a new instrument providing highly reproducible results, having unusual sensitivity over its full range, simple to operate, and applicable for any liquid of the free-flowing, Newtonian type. **(No. 578)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous
ANTI-FREEZES
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze
ANSOLS
Ansol* M
Ansol* PR
ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
Diisooctyl Phthalate
OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate
INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.
ACETONE — A.C.S.
FEED PRODUCTS
Choline Concentrates
Curbay B-G*
DL-Methionine
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Animal Protein Factor Supplement
Vacatone* 40
RESINS (Synthetic and Natural)
Arochem*—modified types
Arofene*—pure phenolics
Aroflat—for special flat finishes
Aroplaz*—alkyds and allied materials
Congo Gums—raw, fused & esterified
Ester Gums—all types
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust
INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents
OTHER PRODUCTS
Collodions
Ethylene
Nitrocellulose Solutions
PiB*—Liquid Insulation
Urethan, U.S.P.
Special Chemicals and Solvents

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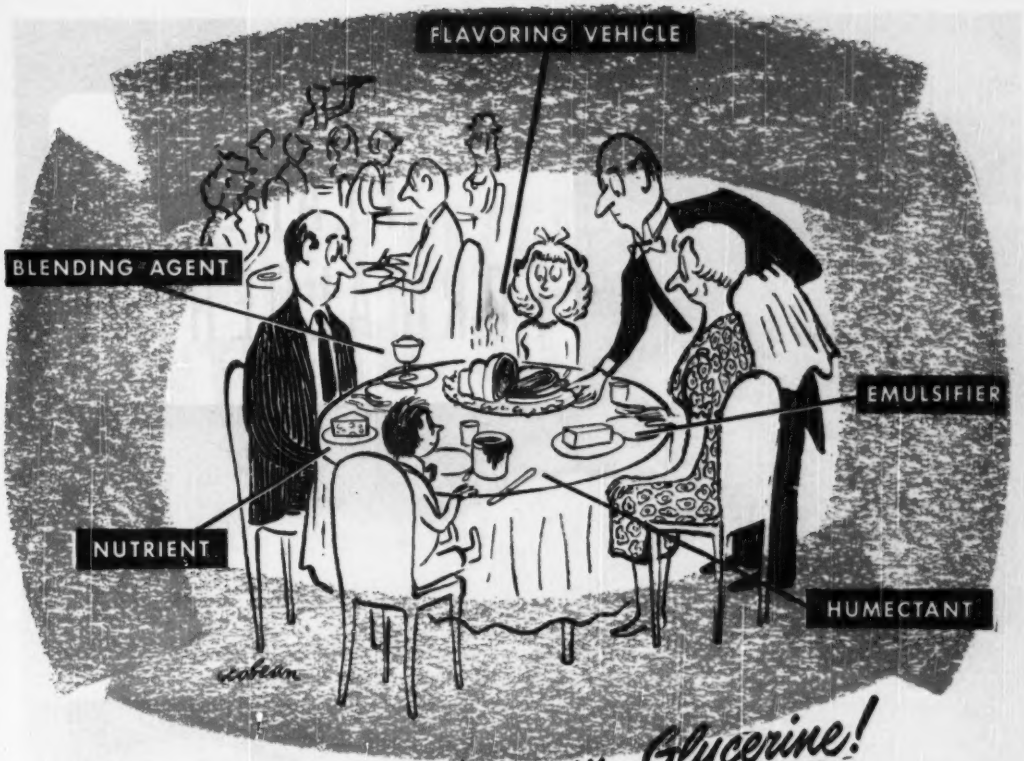


Always on the menu... Glycerine!

TODAY—it's hard to conceive of a menu that does not offer U.S.P. Glycerine in some shape or form! As a humectant, it maintains freshness in foodstuffs...as a sweetener, it sharpens taste and palatability . . . and as a solvent and blending agent, it assures uniform flavor for prolonged periods. U.S.P. Glycerine is actually a *wholesome, nourishing food itself*, providing energy much the same as conventional sugars and fats. Furthermore, because it is universally recognized as a *safe* ingredient, Glycerine's applications in food processing are increasing almost daily! These applications are reviewed in an informative new booklet: "*Why Glycerine for Foods?*"

TOMORROW—Glycerine will pace progress in the food industry as a component in new flavoring compounds, special preservatives, quick freezing processes, and the like. One unusual new application finds U.S.P. Glycerine as a major ingredient in a recently-patented chewing gum that is digestible—and actually nutritious—if swallowed! Glycerine functions as a softener or plasticizing agent in this permanent-chew base—details of which will be sent on request. (Please use your company letterhead.) Here again, as in countless other new developments, Glycerine proves that its unique combination of chemical and physical properties can be matched by no other product!

Nothing takes the place of Glycerine

GLYCERINE PRODUCERS' ASSOCIATION
295 Madison Avenue, New York 17, N. Y.

PLEASE SEND A COPY OF

"**WHY** *Glycerine for Foods?*" Dept. 3

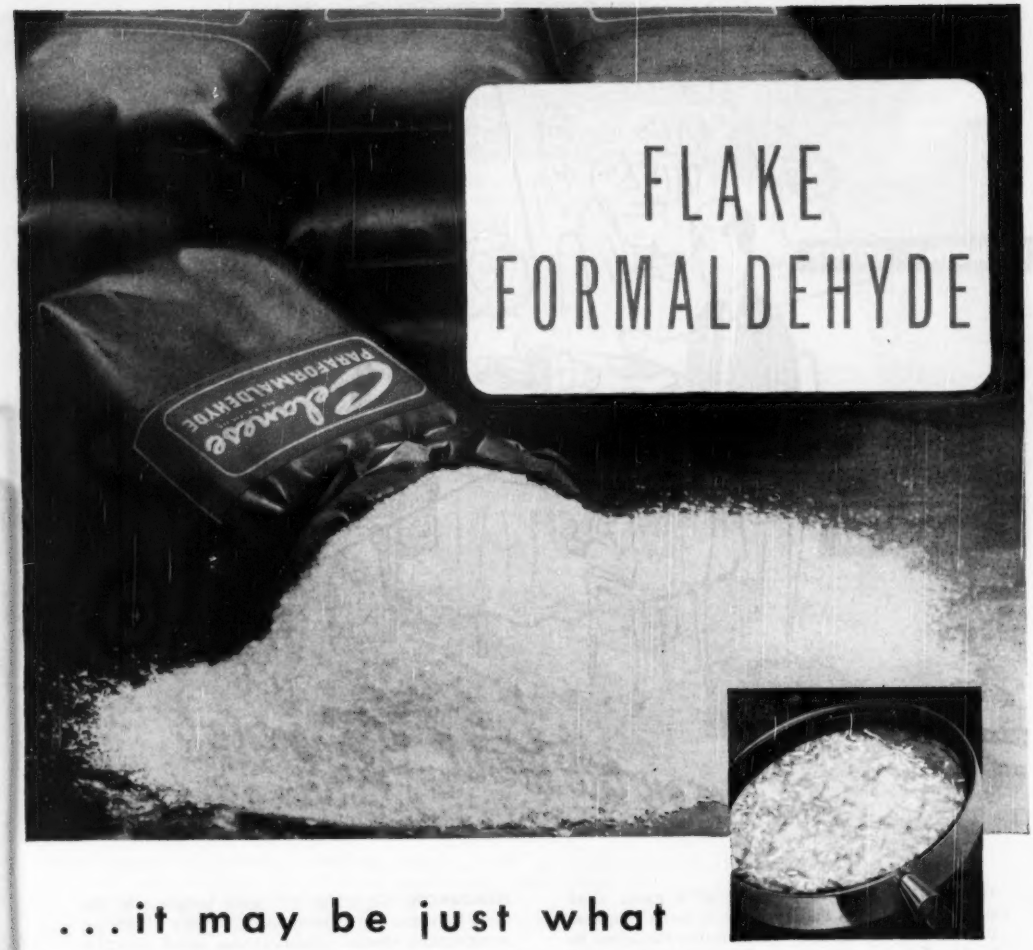
Mr. _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____



...it may be just what your processing needs

Are you searching for processing shortcuts? Flake Formaldehyde, developed by Celanese, may supply the answer to your problem as it has for many processors in fields ranging from modified and high solids resins to fine chemical synthesis.

Flake Formaldehyde is formaldehyde in its most available and easily stored form. Its low water content—less than 9%—is a necessity where almost anhydrous conditions are required and a time and money saver when water must be removed from the final product.

In addition, Celanese* Flake Formaldehyde eliminates the need for heated formalin storage tanks. It is available in multiwall bags and fibre drums . . . offers easy, dustless handling.

We'd like to talk to you about your particular problems . . . tell you about other advantages that flake has to offer. Call your Celanese representative, or write: Celanese Corporation of America, Chemical Division, Dept. 52-F, 180 Madison Ave., New York 16.

Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

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Davison Silica Gel

FINELY-SIZED SYNTHETIC SILICA

—for products or processes requiring non-crystalline silica of high purity—

—as small as .5 micron diameter average!

Davison has the experience and knowledge to chemically control silica gel production for precise uniformity of structure. Such silica gel characteristics as pore size, density and internal surface area are altered to assure maximum benefits in your application.

If you need a finely-sized, non-crystalline synthetic silica of high purity, write for information, specifications and samples of Davison silica gel. We will be happy to give you our recommendations based on experience and research. Mention your proposed application when writing.

Properties

- High purity
- Chemically and physically inert
- High adsorptive capacity
- Low density
- Free flowing
- Surface areas up to 1000 square meters per gram

Typical Uses

- Anti-caking agent in dyes, chemicals, foods, pharmaceuticals
- Decolorization of organic compounds
- Pigment extenders and flatting agents
- Dehydrating agent in aluminum paint
- Insecticide diluents
- Increasing porosity of medicinal tablets
- Selective separation of pharmaceuticals and hydrocarbons

Typical Analysis on Dry Basis 99.71% pure SiO_2

Where cost of materials is a primary factor and constituents of compounds will not affect your process, Davison silica gel can be supplied in less pure form. The material is also available in greater degrees of purity for extremely sensitive processes.

Also Producers Of
SILICOFLUORIDES
CATALYSTS
CASTING COMPOUNDS
ALUM
INORGANIC ACIDS
AGRICULTURAL CHEMICALS

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

Heyden CHLORINATED COMPOUNDS

Intermediates of outstanding value in the production of dyes, pharmaceuticals, essential oils, fungicides and other organic chemicals.

CHLORINATED BENZALDEHYDES
- Ortho-Chlorobenzaldehyde
- Para-Chlorobenzaldehyde
- 2,4-Dichlorobenzaldehyde
- 3,4-Dichlorobenzaldehyde

CHLORINATED BENZOIC ACIDS
- Ortho-Chlorobenzoic Acid
- Para-Chlorobenzoic Acid
- 2,4-Dichlorobenzoic Acid
- 3,4-Dichlorobenzoic Acid

CHLORINATED TOLUENES
- Ortho-Chlorotoluene
- Para-Chlorotoluene
- 2,4-Dichlorotoluene
- 3,4-Dichlorotoluene

CHLORINATED BENZOYL CHLORIDES
- Benzoyl Chloride
- Ortho-Chlorobenzoyl Chloride
- Para-Chlorobenzoyl Chloride
- 2,4-Dichlorobenzoyl Chloride
- 3,4-Dichlorobenzoyl Chloride
- Anisoyl Chloride (Para-Methoxybenzoyl Chloride)

CHLORINATED BENZOTRICHLORIDES
- Benzotrichloride
- Ortho-Chlorobenzotrichloride
- Para-Chlorobenzotrichloride
- 2,4-Dichlorobenzotrichloride
- 3,4-Dichlorobenzotrichloride

CHLORINATED BENZYL CHLORIDES
- Benzyl Chloride
- Ortho-Chlorobenzyl Chloride
- Para-Chlorobenzyl Chloride
- 2,4-Dichlorobenzyl Chloride
- 3,4-Dichlorobenzyl Chloride

Technical literature and samples will be mailed promptly upon request on Company letterhead.

FINE HEYDEN CHEMICALS

HEYDEN CHEMICAL CORPORATION

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SERVING INDUSTRY THROUGH FINER CHEMICALS

NOW—a defoamer in handy 2½-lb. bricks!

Now you can buy your defoamer in easy-to-handle, easy-to-use bricks! No waste! No mess! No heavy drums to handle or ship back! Bricks quickly dissolve in water. One 2½-lb. brick of Defoamer 4* makes 40 gallons. Try this new, low-cost Hercules product today at our expense, and be convinced of its convenience and economy. Send for free sample brick.

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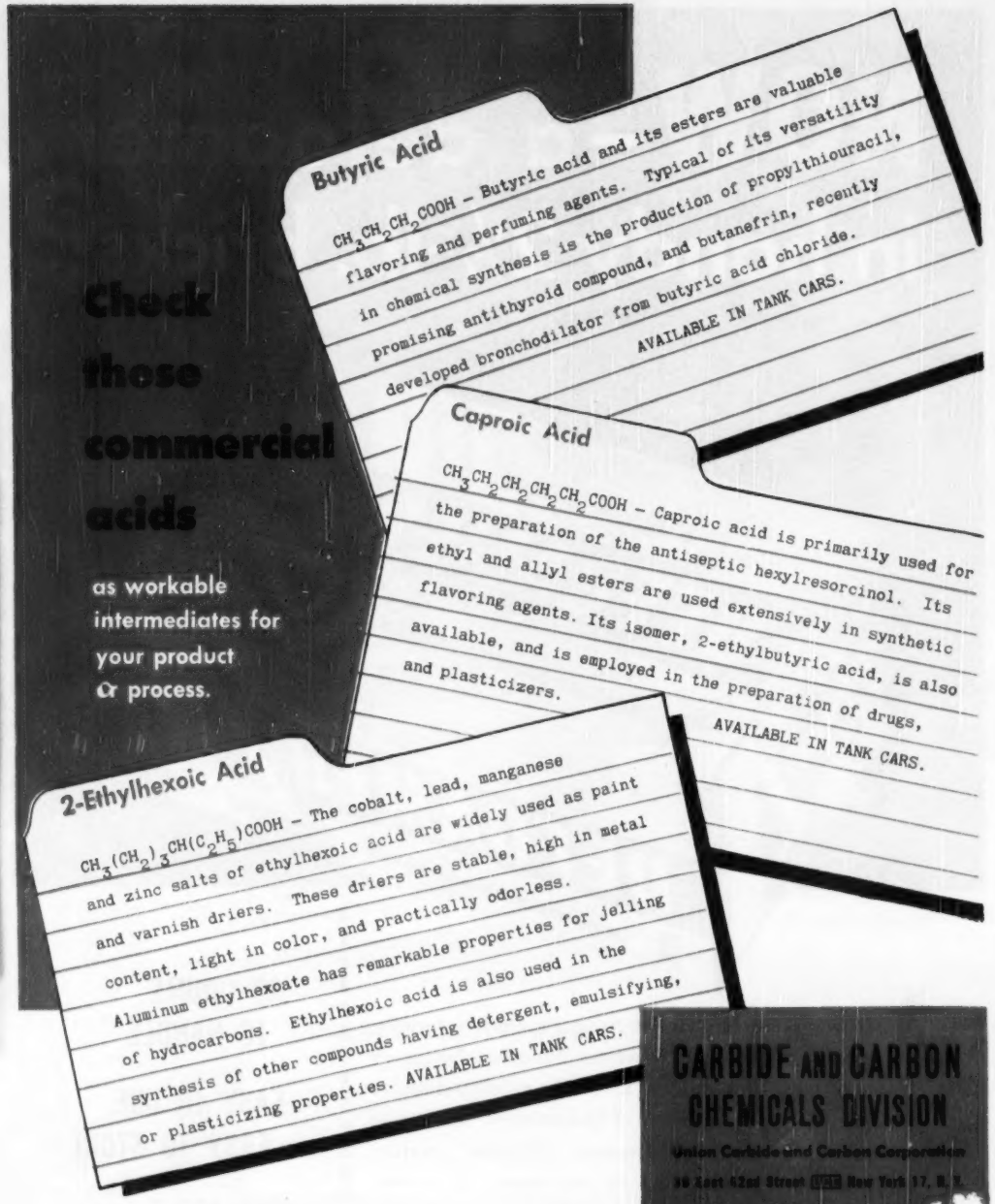
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AVAILABLE IN TANK CARS.
Caproic Acid
$CH_3CH_2CH_2CH_2CH_2COOH$ – Caproic acid is primarily used for the preparation of the antiseptic hexylresorcinol. Its ethyl and allyl esters are used extensively in synthetic flavoring agents. Its isomer, 2-ethylbutyric acid, is also available, and is employed in the preparation of drugs, and plasticizers.
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$CH_3(CH_2)_3CH(C_2H_5)COOH$ – The cobalt, lead, manganese and zinc salts of ethylhexoic acid are widely used as paint and varnish driers. These driers are stable, high in metal content, light in color, and practically odorless. Aluminum ethylhexoate has remarkable properties for jelling of hydrocarbons. Ethylhexoic acid is also used in the synthesis of other compounds having detergent, emulsifying, or plasticizing properties. AVAILABLE IN TANK CARS.

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
June, 1950

For Your Information:

The Shell group has developed a new fiber made from natural rubber and sulfur dioxide. A product of its Amsterdam laboratories, development there was carried through the pilot-plant (single spinneret) stage. It is now being offered for license and has been licensed abroad to the Dutch rayon producer Aku, parent company of American Enka Corp., and others. Development is being carried further by licensees and is now believed to be in the 10- to 20-spinneret stage. Comparable in strength with viscose rayon, it is also cheap, generally stable, and outstandingly resistant to water and solvents.

Good news for polyvinyl alcohol users who recently have been hard put to get enough of this scarce commodity: Bakelite Division of Union Carbide and Carbon Corp. and a Paris company, Rhone-Poulenc, have distributed samples of their output, both of which are still more or less on pilot-plant scale. Shawinigan Chemicals, Ltd., has been making it for its own use and is now supplying some for sale--though it hasn't decided whether this will be a permanent policy. Du Pont's Electrochemical Dept., chief commercial producer, expects to be operating its new capacity at Niagara Falls (CI, Feb. 1949, p. 297) by midsummer. Du Pont will also initiate production of vinyl acetate--polyvinyl alcohol precursor--at Niagara Falls.

* * CI * *

Added starter in the plasticizer field: Pittsburgh Coke and Chemical Co. is now operating a unit to make dioctyl (2-ethylhexyl), di-iso-octyl, and di-n-butyl phthalates; dioctyl and dinonyl (3,5,5-trimethylhexyl) adipates; and dioctyl and di-n-butyl sebacates. Shipments have already been made. A second unit, to produce phosphate ester plasticizers, will be ready in the very near future.

Corn Products Refining Co. will shortly start construction of a semi-works plant at Argo, Ill., to make about two tons a week of glucuronic acid. This product is one of the new synthetics that is showing remarkable results in the treatment of chronic arthritis.

* * CI * *

Monsanto Chemical Co. is building a De Nora mercury-type cell for installation in one of the existing circuits of the company's chlorine plant at Monsanto, Ill. Rated at 24,000 amp., the cell will produce about 1600 lbs. of chlorine per day and over 1800 lbs. of rayon-grade-caustic at any concentration up to 73%. Start-up is expected within four months.

The De Nora cell is already employed in other producers' plants designed by Monsanto's Engineering Sales Dept.

* * CI * *

Westvaco Chemical Division of Food Machinery Corp., which now operates two elemental phosphorus furnaces at Pocatello, Idaho (see "Twice As Much Phosphorus," p. 823) confirms that it will install an additional furnace. Location is top secret. Also to be constructed is a plant in the Kansas City area to convert phosphorus to various commercial phosphates.

Falling demand for methanol caused Du Pont to stop production at Belle, W. Va., confining manufacture to its Sabine River Works in Texas. Part of the product is still refined at Belle, however, since there is insufficient refining capacity at the Texas plant. Resumption of production at Belle hinges on future methanol demand. For the same reason, Carbide and Carbon is gradually shutting down its Niagara Falls methanol plant, concentrating production at Texas City and South Charleston.

Diox 7 (t-butylisopropylbenzene hydroperoxide) is the first of Phillips Petroleum Co.'s much-heralded Diox family (new fast polymerization oxidants for cold synthetic rubber--CI, March 1949, p. 383) to get out of pilot plant. It is now in semi-commercial production.

* * CI * *

Industrial use of atomic energy has created a new worry for makers of photographic film: They're concerned about spoilage of film by small amounts of radioactivity in chemicals that have been exposed to radioactive materials during processing. Growing use of isotopes in quality control, etc., is bringing the problem sharply into focus.

An extensive series of new organic sulfur compounds will be offered shortly by Columbia Organic Chemicals Co., Inc., Columbia, S. C. The firm is doing considerable work on sulfur derivatives in connection with a project sponsored by the American Petroleum Institute.

Carter Products, Inc. (Carter's Little Liver Pills) is test-marketing a new low-pressure aerosol product--a shaving cream dispenser called "Rise" Push Button Shave Cream.

* * CI * *

Here and There:

Caslon, Rubberset Co.'s synthetic casein fiber, is now used for the pads above and below the inner springs on several models of Simmons mattresses....Columbia Chemical Division of Pittsburgh Plate Glass will up its benzene hexachloride output for the next insecticide season....Commercial Solvents Corp. has completed and is now operating its pentaerythritol plant at Agnew, Cal. (CI Newsletter, Nov. 1949)....Utilization of low-grade zinc ores—soon necessary as high-grade ores run out--may be feasible as a result of a new process involving chlorination developed at Columbia University.... Newspaper reports of damage to American Agricultural Chemical Co.'s works at South Amboy, N. J., by the recent munitions explosion were considerably exaggerated. Shutdown for repairs will be of relatively short duration.

The Editors

Woodworking adhesives, dyestuffs, explosives, pharmaceuticals, medicinals, textile and leather chemicals, and compounds that give increased adhesion of rubber to fabrics and cords are all end products of the reactions of Koppers Resorcinol.

The versatile nature of Resorcinol is the result of its high reactivity; the three hydrogen atoms adjacent to the hydroxyl groups are particularly reactive. As a result, Resorcinol undergoes many interesting and unusual reactions in addition to those typical of phenol . . . reactions which may suggest new and undeveloped commercial possibilities to you.

Koppers offers Resorcinol to you in two grades. Koppers Resorcinol, Technical, for most chemical manufacturing and processing use, is offered in flake form with minimum purity of 98.5%. Koppers Resorcinol, U.S.P., for medicinal and pharmaceutical applications, is in the form of fine crystals with minimum purity of 99.5%.

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Bulletin C-9-124 describes many of the interesting and unusual reactions of Resorcinol, as well as its physical and chemical properties and its uses. Write for your copy.

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THE CASE FOR CHEMICAL TARIFFS

by ***ROBERT L. TAYLOR, Editor***

IT WOULD SEEM THAT so soon after World War II, Government policymakers should need little reminder of the importance of chemicals and a strong chemical industry to the defense of the nation. No industry contributed more to the advances in materials and weapons that made the Allied victory possible.

Yet, coming out of Washington a couple of months ago was a State Department recommendation which makes one wonder if the lessons of 1941-45 have already been forgotten. If carried out it would undermine—and possibly eventually even force out of existence—an important segment of the American chemical industry.

The recommendation, offered in connection with the forthcoming multi-nation trade conference at Torquay, England, is to the effect that the United States delegates to this conference be prepared to negotiate tariff reductions on an extensive list of manufactured items, which includes among others a large number of chemicals.

Commenting on the recommendation before the Committee for Reciprocity Information last month, Donald K. Ballman, general sales manager of The Dow Chemical Co., said that some 200 of his company's products come within either the specific or class designations mentioned for reduction. Representatives of other chemical companies similarly pointed out how the reductions would threaten parts of their businesses.

The thing that people outside the chemical industry seem to find so hard to understand is the intricate interrelationships between the products of this industry. They fail to see why it is virtually impossible to separate chemicals into two piles and say, "These are important to national defense, and these over here are not."

Certainly in the mid-'thirties when styrene first appeared on the American market as a fledgling plastic there was no possible way of foreseeing that less than a decade hence this inconspicuous, little-known material would play a crucial part in the nation's struggle for existence. It is unpleasant to think of what would have confronted us in our synthetic rubber program if, through lack of tariff protection, we had been dependent for styrene on Germany, where it was made first.

Or recall again the classic case of dye intermediates. Largely non-critical as far as their original use for making dyes is concerned, they nevertheless provided the foundation for our modern organic chemical industry which contributed critical insecticides, fungicides, coatings, lubricants, fuels, explosives and medicinals to the winning of World War II. Without tariff protection, America's leadership today in organic chemicals would have been impossible.

This present top-dog position of the United States among the chemical industries of the world is what has led many to take the position that we no longer need tariff protection for chemicals. The industry is big and strong now, is the contention. It doesn't need special consideration. It can take care of itself.

That might be true in a free market where all manufacturers pay comparable wage rates. But it is not true where wages and standards of living vary as much as 1000%, or where currencies are devalued at will to obtain competitive advantages.

It has been pointed out, for example, that average chemical plant wages in Great Britain, which is far from a low-wage country by world standards, are less than one-third those in representative American plants. American methods and technology may be superior (which is debatable in more than one category of chemical manufacturing) but they are hardly superior enough to offset such an advantage.

Any reduction in chemical tariffs at this time is playing directly into the hands of America's enemies. The responsibilities of the United States for keeping the peace of the world are such that we can ill afford to do anything that would weaken our economy or slow our technological progress. The case was stated succinctly last month by William P. Marsh, president of U. S. Industrial Chemicals, Inc.: "If national policy requires further tariff concessions as a stimulant to international trade, such concessions should apply only to industries where greater reliance upon foreign sources of supply will not endanger the national defense."

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IN NON-AQUEOUS SYSTEMS

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Solidification Point:
—36°C, approx.
Surface Tension of Saturated Aqueous Solution:
Less than 35 dynes/cm
Interfacial Tension Against Water of a 1% Solution in Mineral Oil:
1 to 2 dynes/cm
Flash Point, Cleveland Open Cup:
430°F
Solubility in:
Water
Less than 0.002% by weight
Mineral and Vegetable Oils
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Miscible with naphtha, benzene, kerosene, carbon tetrachloride, ethyl acetate, acetone, methanol, butanol, and most other organic solvents.

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What's new

TWICE AS MUCH PHOSPHORUS

By 1951 elemental phosphorus capacity will be almost twice 1946's. Reasons: detergent builders, new uses for phosphoric acid.

ESTABLISHED producers and neophytes have been scrambling in the last few years to put up new phosphorus furnaces. Early next year, when plants now under construction are completed, U. S. productive capacity will be almost twice as great as it was five years ago, and output will come close to doubling wartime's peak (in 1944) of 85,000 tons. What's more, additional facilities are in the not-too-distant offing.

Back in 1946, when production was about 80,000 tons, three producers—Monsanto Chemical Co., Victor Chemical Works, and the Tennessee Valley Authority—turned out better than 90% of it. Oldbury Electro-Chemical Co., American Agricultural Chemical Co., and Virginia-Carolina Chemical Corp. accounted for the remainder.

Came the Deluge

Shortly thereafter Virginia-Carolina suspended its phosphorus operations, anticipating a long-term oversupply. Since then it has doubled its furnace capacity at Nichols, Fla., and this spring completed a new furnace at Charleston, S. C.

Its like-minded competitors were also busy building. Monsanto is now constructing its sixth furnace at Monsanto, Tenn. (its third since the war); Victor installed a large furnace at Tarpon Springs, Fla., late in 1947 and increased its capacity at Mt. Pleasant, Tenn., in 1948; Oldbury has recently upped its capacity at Niagara Falls by 5,000 tons.

New Producers

A new producer, Westvaco Chemical Division of Food Machinery Corp., entered the field with two furnaces at Pocatello, Idaho (*CI, Jan. 1948, p. 49*). The first was completed early last year, the second just recently.

Latest entry is Columbia Electro-Chemical Phosphate Co., Cascade Locks, Ore., whose 5,000-KVA furnace will reportedly start turning out phosphorus next month for conversion into phosphoric acid to make triple superphosphate. Power consumption of the furnace indicates annual phosphorus production capacity of about 3,000 tons.

Adds Up to a Lot

All this adds up to a sizable capacity increase, and when plants now being built are completed next year, total capacity will be pushing 160,000 tons. No reliable figures for individual producers are available, but putting two and two together gives an estimate something like this:

Producer	*Location*	*Estimated Capacity (1,000 short tons/year)*
Monsanto	Columbia, Tenn.; Monsanto, Tenn.	65
Victor	Mt. Pleasant, Tenn.; Tarpon Springs, Fla.	35
TVA	Wilson Dam, Ala.	20
Westvaco	Pocatello, Idaho	17
Oldbury	Niagara Falls, N. Y.	8
Virginia-Carolina	Nichols, Fla.; Charleston, S. C.	8
American Agricultural	South Amboy, N. J.	3
Columbia Electro-Chemical	Cascade Locks, Ore.	3
Total		159

It must be remembered that capacity is a somewhat nebulous and theoretical figure. Many plants are supplied with interruptible power, and production is sometimes seasonally curtailed. That output last year was close to then-current capacity, however, is indicated by the fact that 116,000 tons of phosphorus were required for the reported production (730,751 tons) of 50% phosphoric acid. (A comparable amount of acid was made directly from phosphate rock by the so-called "wet process.") Additional large tonnages of phosphorus—probably about 8,000 tons—were converted to the pentoxide, oxychloride, chlorides and sulfides.

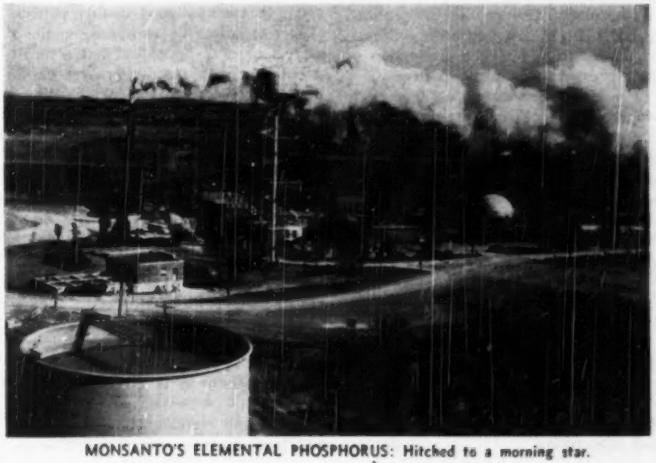
All phosphorus, incidentally, is now made by electric-furnace smelting of phosphate rock, coke and sand. Victor once operated a blast-furnace reduction process.

Can't Escape It

The chemical world moves so fast that the 1944 phosphorus end-use pattern—the only official one available—is ancient history. It is instructive to examine it, though, to see where greatest changes have taken place:

1944 End-Use	*Quantity (1,000 lbs.)*	*Per Cent*
Total (excluding military and foreign)	108,090	100.0
Foods and fertilizer	38,166	35.2
Plastics, coatings, surface protection	26,255	24.3
Soaps and detergents	19,669	18.2
Petroleum operations	6,681	6.2
Matches, fire retardants	5,304	4.9
Pharmaceuticals and dentifrices	4,047	3.8
Other	7,968	7.4

Phosphorus and its derivatives are ubiquitous, and their growth can be explained in part as a corollary to the growth of over-all chemical produc-



MONSANTO'S ELEMENTAL PHOSPHORUS: Hitched to a morning star.

tion. Still, there are specific areas where growth has been spectacular.

Foremost among these is the increasing emphasis on built soaps and synthetic detergents. Output of tetrasodium pyrophosphate, for example, which is widely used as a soap builder, jumped from 43,447 tons in 1945 to 78,376 tons last year. Other builders, including the fast-growing sodium tripolyphosphate which is used in proportions as high as 50% in built synthetic detergents, show similar phenomenal growth patterns.

More Acid

Production of phosphoric acid from phosphorus last year was 38% over 1947, 100% over 1945. Its food and pharmaceutical uses, as well as the applications of its salts in flameproofing, water treatment, surface treatment of metals, etc., have all grown.

Until Columbia Electro-Chemical announced its plans, TVA was the only producer using phosphorus-derived acid in the manufacture of triple superphosphate fertilizer. Other fertilizer makers use "wet-process" phosphoric—made directly from rock phosphate with sulfuric acid. Rather special economic conditions are required for use of phosphorus-derived acid in fertilizers, so expansion in that direction is unlikely.

Phosphate esters—used largely as plasticizers for vinyl resins—have grown rapidly in the last few years. Postwar material shortages held production to wartime levels, but expansion has been rapid since. Monsanto estimates that annual output of vinyl plasticizers (which includes many phosphate esters) is now over 100 million lbs., and its own sales (in lbs.) have increased 2½ times over 1946.

Phosphorus pentasulfide has received a boost from two sources: synthesis of parathion and larger production of high-pressure lubricant additives.

Producers are confident that their wagons are hitched to a morning star. Faint hearts might think that 1951 capacity would be ample for the foreseeable future, but Westvaco is reportedly planning an expansion that would make it the second largest producer—and that makes the expansion greater than its current capacity. And Victor, as if determined to retain its No. 2 spot, is seriously considering enlargement of its capacity.

These moves, if consummated, may put phosphorus in a "long" position marketwise for a time, but those who know phosphorus best believe that further growth of its application is a normal expectation.

BALANCED INK

By controlling a balancing act, Time, Inc. develops fastest-setting printing ink.

TIME, INC.'S shiny postwar research laboratories at Springdale (part of Stamford), Conn., have one main objective: to find ways to print magazines faster, better and cheaper.

One obstacle to greater printing speeds has been the time required for ink to set. Some years ago this problem was partially licked by development of heat-set inks, but these brought with them a new headache. As press speeds increased, the heat necessary to

ROBERT M. LEEKLEY: Three are faster.

set the inks also increased, until on today's high-speed presses the printed sheet is subjected to near-scorch temperatures which cause appreciable increase in brittleness and loss of strength even in good quality papers.

It was primarily to overcome these effects of heat on paper that a small group of Time researchers set out a couple of years ago, under the direction of ex-Du Pont chemical engineer Robert M. Leekley, to find an ink that would set rapidly without heat. Last month it appeared they had met with success.

How It Works

Since the new ink is still in the patent application stage, full details are not available. But according to Time's coordinator of research, Roswell E. (Bud) Fisher, it involves an entirely new principle of drying: the upsetting of equilibrium in a three-component system.

The three components are a resin and two solvents, one of which is an alcohol. The resin is insoluble in either solvent alone, but is completely soluble in a given combination of the two. If the solvent balance is upset, however, the resin immediately precipitates out and the ink sets.

When the new ink hits the paper, a sufficient quantity of one solvent is almost instantaneously removed — through a combination of evaporation and absorption—to cause setting. Experimental press runs at 1,000 ft. per minute (as against about 800 for usual high-speed operation) have been successful without use of heat. Best results, however, are obtained with around 15 to 20% of scorch heat, which is not sufficient to affect the paper. The ink ultimately dries to a hard glossy film with good tone.

Time will not manufacture the ink itself, but expects to work with an established ink maker in setting up production facilities as soon as developmental work is completed. It believes the ink will eventually permit even higher press speeds than present experimental runs.

ACID INCINERATOR

New process uses submerged heating to dispose of iron sulfate-sulfuric acid waste economically.

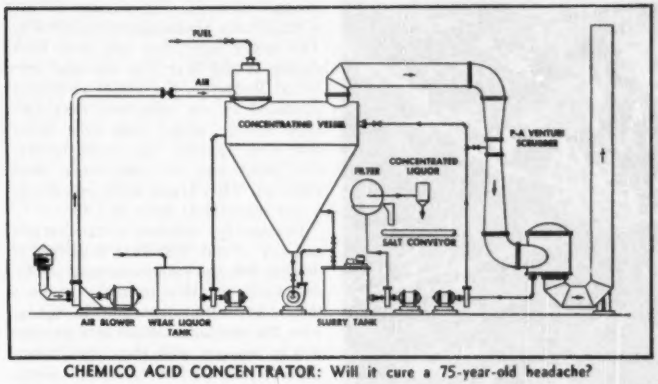
THE steel business is used to problems, but it is a mite sensitive about its inability to get rid of one that has dogged its steps for nearly 75 years: what to do with the huge quantities of spent acid pickle liquors that stream from its mills daily. More recently the titanium pigment industry has been beset with a similar headache. It produces an almost identical waste from sulfuric acid digestion of titanium ores to separate the iron. In both cases, most companies are still pouring their waste liquors into a convenient stream or body of water.

Last month sulfuric-acid-wise Chemical Construction Corp. of New York came up with what it thinks may be an answer.

The Process

Both steel mill and titanium wastes consist of water solutions containing anywhere from 2 to 15% free sulfuric acid and 10 to 15% ferrous sulfate. The big problem is to get rid of these on a large scale without cost and without creating an effluent or a smoke nuisance.

Chemico would do this by concentrating the free acid with a submerged combustion heater to a strength of 60% H_2SO_4 or greater, at which point the sulfate precipitates out in a readily



CHEMICO ACID CONCENTRATOR: Will it cure a 75-year-old headache?

filterable form. Atmospheric pollution is avoided by running the combustion gases out through a Pease-Anthony venturi scrubber (see cut). Recovered sulfate is processed to fresh acid by sintering with coal to produce a gas sufficiently high in sulfur dioxide to give good contact acid plant operation.

To prove the process, Chemical Construction installed a semi-commercial plant in conjunction with titanium dioxide operations at Piney River, Va. Designed to process 50 tons of liquor a day, this unit produced acid that was reused in the pigment plant and also sold to superphosphate fertilizer manufacturers in the neighborhood. Scheduled for fall completion is a full commercial unit to process 25,000 imperial gallons of pickle liquor a day for South African Iron and Steel Corp. at Pretoria.

And the Cost

The complete installation requires a substantial investment and obviously puts the purchaser in the sulfuric acid manufacturing business. This is not as frightening as it sounds, however, for sulfuric acid plants have been added to metallurgical operations at a profit and many large oil refineries are recovering sulfuric acid from refinery sludges and producing new acid from sludge and sulfur.

Where a steel mill or titanium plant operates at a low rate of acid consumption, it may be desirable to install only the concentrating and filtering portion of the process. This recovers about 85% of the acid delivered to the recovery plant and produces a sulfate that can be dumped on a slag heap or shipped as raw material to a nearby sulfuric acid manufacturing plant. Such an installation, according to Chemical Construction, would pay for itself in 6 to 12 months, even if the iron sulfate has no sale value. The complete installation, on the other hand, including facilities for converting the sulfate to sulfuric acid, is estimated to pay out in 4 to 8 years, depending on the cost of new acid delivered in the locality.

TRACTABLE CHLORINE

New organic chlorine sanitizing compound is stable, highly soluble, works in acid solution.

ASK a sanitation chemist to describe the ideal chlorine disinfectant, and he'll tell you it should be a stable, nonhygroscopic material, instantaneously soluble in water to give a clear solution, and should leave no insoluble or toxic residue. It would also be desirable if the chlorine were released in neutral or slightly acid solutions, where its germicidal effectiveness is greater.

He'd also tell you—unless he knows about Paul Gottfried's Paulen Chemical Co.—that such a material, like Plato's ideal chair, is just a philosopher's daydream.

Gottfried's Gamble

That such a material does exist is due to Gottfried's gamble. An old Washington hand—he has successively been in the Tariff Commission, with WPB, and a consulting chemist—he knew that the military services had experimented with 1,3-dichloro-5,5-dimethylhydantoin as a germicide, had learned that it was too insoluble for adequate effectiveness.

He set to work on the compound, gambled two years on the possibility of adapting it for commercial use. By certain physical and chemical modifications, which for obvious reasons he's keeping to himself, he succeeded in making an instantaneously soluble material that will release up to 1600 p.p.m. of available chlorine.

While the base material contains a minimum of 66% available chlorine, Gottfried's soluble formulation, which he calls Antibac-25, releases 16% available chlorine. Unlike the common alkaline-type disinfectants which liberate highly ionized sodium hypochlorite, Antibac-25 forms hypochlorous acid in a medium sufficiently acid to suppress its ionization. Previous research (by Scales and Kemp) has shown that the hypochlorite ion is 38% less efficient as a germicide than the free acid, and consequently a higher chlorine level must be used with the alkaline materials.

Other advantages: Antibac dissolves completely at normal working concentrations. No sediment is deposited and hence there is no need to prepare stock solutions. Also, the residue, which remains in solution, is non-toxic dimethylhydantoin.

Long shelf life is another important attribute. Since Antibac is not hygroscopic, it doesn't decompose rapidly even if it is exposed in a humid atmosphere. A sample exposed on a watch glass for 10 days in an atmosphere of 100% relative humidity retained over 95% of its effectiveness.

Price is Low

Gottfried's company, which is at 1122 19th St. N.W., Washington 6, D. C., was set up as a consulting rather than a manufacturing firm. But now it is plunging into large-scale manufacture of the new germicide, which is already being used by Washington's Embassy Dairy, Inc., among others.

Antibac's price is competitive. In line with other chlorine disinfectants even on a per-pound basis, a little goes a long way, and its unique advantages add an extra fillip to sales prospects.

PAUL GOTTFRIED: He gambled that it would dissolve.

TEC AT KINGSPORT: First, chemicals for safety film.

FROM WOOD DISTILLATION TO OXO

Originally just a supplier of chemicals to Eastman Kodak, Tennessee Eastman Corp. now sells $90 million worth a year.

THIS MONTH Tennessee Eastman Corp. starts its fourth decade of operation Over the past 30 years, a small lumbering and wood distillation operation has grown into an industrial giant with estimated gross sales approaching $90 million, accounting for nearly a quarter of the total sales of the parent organization, Eastman Kodak Co. Roughly 80% of this total represents sales of cellulose esters, both flake and fiber. The remainder, nearly $20 million, is direct sales of chemicals, and chemicals are on the upswing. TEC's chemical products catalog for 1949 listed 47 different chemicals, while that for 1950 lists 55.

Three of the additions are phthalate esters, (dibutyl, dimethyl, and di-methoxyethyl), while the rest are aliphatic chemicals—*n*-butanol, 2-ethyl hexanol, *n*-butyl acetate, isobutyraldehyde, and aluminum isopropoxide. Thus, in TEC, industry has a second producer of synthetic *n*-butanol, Carbide and Carbon being the first.

Butyric Acid via Oxo

One of these new products, isobutyraldehyde, is a refugee from TEC's Oxo pilot plant and is available only in limited quantities. However, this limited availability will not continue. TEC is now constructing a petrochemicals plant on a 2500-acre site at Longview, Texas. It has been announced that the major product of this plant will be *n*-butyric acid for the production of Tenite II, a cellulose acetate-butyrate plastic used principally for the production of various coatings.

TEC has disclosed little concerning the process to be used at Longview beyond noting that it is a modification of the well-known Oxo synthesis. By this synthesis propylene (presumably produced by propane cracking) will be reacted with a mixture of carbon monoxide and hydrogen to form a mixture of *n*-butyraldehyde and isobutyraldehyde. These two aldehydes will be fractionated and oxidation of the *n*-butyraldehyde will give *n*-butyric acid.

n-Butyraldehyde is currently prepared from ethanol-derived acetaldehyde by a variation of the aldol synthesis, presumably by dimerizing acetaldehyde to crotonaldehyde followed by hydrogenation to form *n*-butyraldehyde.

The Oxo unit constitutes at present the only specific project for the new Longview location. But since this project will not require 2500 acres, TEC is looking toward eventual establishment of a major petrochemical producing center at this location, probably to make use of its huge investment in the study of hydrocarbon cracking to produce acetylene.

Wood Alcohol First

TEC was established back in the days when wood alcohol—methanol—was all produced from wood. In 1920 TEC started to operate a hardwood distillation plant at Kingsport, Tenn. to produce methanol and acetone for use in Eastman's production of safety film. The wood distillation unit was built during World War I by the American Wood Reduction Co. Other chemicals produced by the operation were calcium acetate, acetic acid, wood creosote, and charcoal. The wood distillation plant was not shut down until 1944, but TEC began using ethanol as a raw material as early as 1930.

Demand for cellulose acetate surged and late in the '20s TEC developed a process for the manufacture of acetic anhydride. In this operation sodium acetate and sulfur monochloride, S_2Cl_2, were the reactants. While this process was in use—up until about 1933 when Carbide and Carbon Chemicals Corp. began production of acetic anhydride by reacting ketene (from the demethanation of acetone) with acetic acid—TEC and Dow Chemical Co. accounted for almost all of domestic anhydride production. In 1934, TEC began to make anhydride from dehydrated acetic acid (ketene) and acetic acid, and at least two other processes have been placed in operation by other organizations (*CI, Aug. 1948, p. 217*).

Enter Estron

Cellulose acetate for safety film had been produced by Kodak since 1909 at Rochester, N. Y. Operations were transferred to Kingsport in 1930. However, even with the large volume of safety film required by Kodak, a larger production volume would provide important economies and 1928 saw experimental work begin at Kingsport for conversion of cellulose acetate flake to yarn. By Feb. 1929 production had reached two pounds a day. In 1931, the first year of full-time production, 287,000 pounds of yarn were manufactured. This rate of expansion has continued until today TEC is the second largest producer of cellulose acetate with an estimated capacity of well over 100 million pounds per year.

And Hydroquinone

Hydroquinone had been an important photographic chemical for many years when its manufacture was transferred from Eastman Chemical Co., at Passaic Junction, N. J., to Kingsport in 1930. Since that time research on other uses has been so successful that less than half of TEC's hydroquinone output is used today for photographic purposes. It is used, *inter alia*, as an oxidation inhibitor for cracked gasolines and for natural and synthetic rubber.

TEC makes hydroquinone by oxidizing aniline with potassium permanganate. As a result, quantities of man-

ganese sulfate must be disposed of. This problem was relieved by findings, in the early '30s, that addition of manganese traces to citrus fruit fertilizers increased the yield several times over. Still later the value of this mineral in animal and poultry diets was recognized, and today between ten and twelve thousand tons of manganese sulfate, Tecmangam, are being marketed each year.

Aliphatics and Aromatics Too

Kingsport is a sizable producer of aromatic chemicals such as aminophenols and various aniline and amine derivatives. The aminophenols are presumably sold to Kodak for photographic use, while several other products serve as intermediates in the manufacture of Eastman acetate dyestuffs.

To satisfy its needs for non-cellulose estron raw materials—principally acetic acid, acetic anhydride and acetone—TEC was forced to install the country's largest acetic acid and anhydride plant. This plant utilizes ethanol from the plant of Esso-Standard Oil Co. at Baton Rouge, La., as the raw material. Esso also furnishes isopropanol, a raw material for acetone and isopropyl acetate. Acetone is the solvent used in estron spinning operations. Other products from ethanol via acetaldehyde include 2-ethylbutanol, crotonic acid and triethyl phosphate.

TEC has a large fund of aliphatic chemical production know-how and a backlog of ideas from its intensive research program. These plus the new plant at Longview make it a formidable competitor in the high-stakes game of aliphatic chemicals markets.

EYE FOR INDUSTRY

Television can keep an eye on hazardous processes, permit better control.

JUST as the telephone has multiplied the human ear and machines the human hand, so now is television multiplying the human eye.

A supervisor can sit in his office and talk to his men anywhere in the plant. A researcher in a "hot" laboratory can push buttons and pull levers and thereby perform operations on radioactive materials safely behind protective barriers.

Now industrial television is banishing the last excuse for moving: to "go have a look." While it may make for more steatopygous chemists, it may also increase their longevity, for it can stand and watch in danger spots—where it's hot, where there are toxic fumes, or where an explosion is possible.

Everything at Once

Television has already been used for quasi-chemical purposes: Monsanto Chemical Co., for instance, recently ensconced its guests in comfortable chairs and took them on a "plant tour" via television.

But now interest is growing in actual production applications. It can bring all the control panels in a large plant—even if they're miles apart—within the purview of a single supervisor. It can watch nuclear reactions, where death-dealing radiation makes human approach impossible. It can inspect such inaccessible areas as interiors of vessels and large pipes.

Several TV manufacturers are already out to sell the industrial market. Radio Corporation of America has a new small camera, Vidicon, only 10" x 5" x 3", that can be focused by remote control. Addition of line amplifiers makes it possible to transmit the picture by cable as far as desired. The RCA set-up (one camera, one monitor, no sound) probably will be sold for about $6500, and the eventual price is expected to be below $5000. The monitor draws 350 watts and plugs into standard 110-volt AC.

Capehart-Farnsworth Corp. and Diamond Power Specialty Corp. have combined to produce the "Utiliscope," units of which are a camera, a monitor, and a power source. The camera is larger, 8" x 10" x 17", but it weighs only 72 lbs. Power requirement is 245 watts of 110-volt AC.

A more expensive set-up—in color, however—is Du Mont's camera and viewer that sells for $19,800. (A black-and-white system would cost $18,000.) It has the advantage of being able to monitor remote color reactions. A deluxe system, it stresses high fidelity and versatility.

LOW-FAULT ASPHALT

Addition of phosphorous pentoxide to air in air-blowing asphalt enhances temperature resistance.

TO Joe Doakes, asphalt is a black surfacing material for streets and highways. To Lion Oil Co. it is big business, and Lion has an extensive long-term research program aimed at improving asphalt properties.

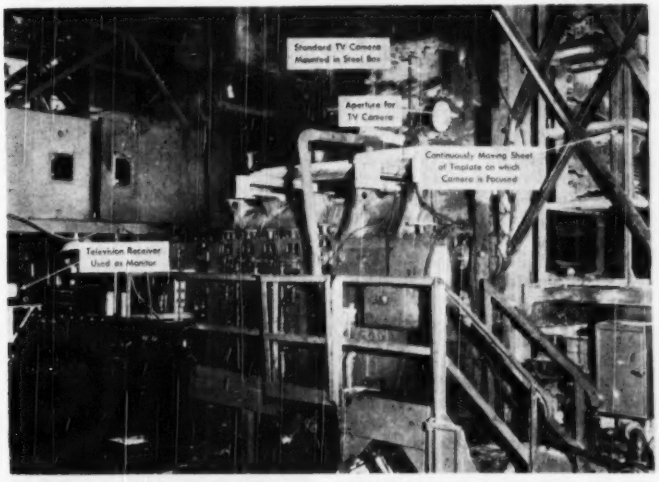
The newest wrinkle is the result of work by Lion's Arnold J. Hoiberg. Says Dr. Hoiberg,* add from 0.5% to 3.0% of phosphorus pentoxide when blowing asphalt with air. Uusually 1.0% is sufficient. The product has greatly improved resistance to both high and low temperature, and ductility and toughness are also improved.

First Air-Blowing

The first asphalts were naturally-occuring hydrocarbon minerals; later, certain crude-oil fractionation residues provided a very satisfactory product.

Then at the turn of the century the basis was laid for both more and a better product. Heating crude residue to 300-500° F. and blowing with air did the trick. Little oxygen enters the asphalt molecules; it appears, rather, that an oxidative dehydrogenation first occurs, and high-molecular-weight

* U.S.P. 2,450,756 and C.P. 448,738


Standard TV Camera Mounted in Steel Box
Aperture for TV Camera
Continuously Moving Sheet of Tinplate on which Camera is Focused
Television Receiver Used as Monitor

TELEVISION: More sitting, longer life.

ARNOLD J. HOIBERG: When blowing, add P_2O_5.

products are then formed by condensation and polymerization.

At present about a third of the nine million tons per year of asphalt production is air blown.

Enter Catalysts

Catalysis in asphalt production was patented as early as 1876 (permanganates and oxides of lead and manganese); but it wasn't until 1930 that catalysts were used regularly, even on a small scale. Addition of ferric chloride before air-blowing was found to give a greatly improved product, and this discovery has been used to produce a roofing asphalt from otherwise unusable residues. Copper sulfate was used on a small scale as early as 1911 to cut down blowing time, but the asphalt continued to harden and become more brittle while in service.

Phosphorus pentoxide-blown asphalts give the desired property improvements without embrittling. Their cost is increased only by the cost of the phosphorus pentoxide used.

First major use of this product has been by the Bureau of Reclamation for lining irrigation ditches to control seepage. It is applied as a ⅜" thick coating by spraying. More recently a prefabricated membrane about ¼" thick backed with Kraft paper has been introduced for lining small irrigation ditches and other sites where increased simplicity of application outweighs the cost differential.

Ditch lining promises to be the largest tonnage outlet for pentoxide-blown asphalt, but the material has also shown long life when used as a base for tank paints. Its small change in consistency with temperature also makes it well suited for specialty coatings and saturants for caulking cords.

INSECT ACK-ACK

Insect repellent and dog spray are new additions to low-pressure aerosols.

THIS SUMMER the fisherman who sprays his dog with an aerosol, and then picks up a different can to squirt himself, may find food for thought in the vulnerability to insect pests he shares with the animal. Whether he will be wiser after wrestling with any philosophical implications in this common bond is problematical.

He should, however, be able to enjoy his contemplation free from any annoying insects as he waits for a strike on his line; and the dog, protected from fleas, ticks and gnats, can sleep peacefully on the bank.

Benefactor of both is Knapp-Monarch Co., St. Louis, Mo., which has just added Repel-A-Mist insect repellent and Magik-Rid Dog Spray to its extensive line of aerosols. The new products—low-pressure types—have recently been test-marketed, are now being nationally distributed. Both are packaged in twelve-ounce containers, the former retailing for $1.95; the latter, for $1.69.

Picnics A Pleasure

Active ingredient in Repel-A-Mist is the well-known insect repellent 2-ethyl hexanediol-1,3. The formulation contains 20% repellent, 70% propellent (dichlorodifluoromethane), and 10% solvent (isopropyl alcohol). Directions call for spraying exposed skin and clothing—particularly socks, shoes, trouser cuffs—from a distance of at least 12 inches. Where spraying is impractical (spray should not be directed toward eyes or mouth or on finished surfaces or near open flame) it is sprayed on the hands and applied to the other parts of the body.

With freedom from mosquitoes, gnats, flies, fleas, chiggers and other insects promised by pressing a button, picnickers can now hold a hot dog in one hand and a pop bottle in the other, instead of standing guard with an open palm. The convenient method of application is also expected to increase the popularity of insect repellents with boaters, hunters, campers, and the like, and with people whose children and pets seem to be favorite targets of bugs. Sprayed on screens, it keeps away the little ones that normally slip through.

Magik-Rid, the aerosol designed to make a dog's life somewhat less so, can be used to advantage on the animal, its house, and favorite haunts around the house. It not only kills ticks, lice, gnats, fleas and flies, but helps to keep them away. This product is a formulation of pyrethrins (0.20%), hydrogenated rotenone and other cube resins (0.10%), technical piperonyl butoxide (0.90%), citrus oils (1.00%), ethylene glycol ether of pinene (1.95%) and petroleum distillate (5.85%) with the remainder a 50:50 mixture of Freon 11 and Freon 12 as propellent. Outlets are pet shops, veterinarians, drug, sports, grocery and variety stores.

BETTER THAN ONE

Mixtures of penicillin and bacitracin are far more effective than either one singly.

SYNERGISM is that amazing phenomenon wherein two plus two adds up to a lot more than four.

There were a couple of good reasons for Commercial Solvents Corp. to study synergistic activity of bacitracin and penicillin, and the answer adds up to a mighty step forward for CSC's fair-haired boy, bacitracin.

First of all, resistance to one antibiotic is probably inherited without regard to a second one. Thus if one or two cells in a million escape the clutches of antibiotic A, chances are they'll be caught by antibiotic B. This is merely an additive effect, but it is useful for patients whose "bugs" have been toughened by repeated doses of a particular antibiotic.

A second reason for CSC's interest is that bacitracin is relatively toxic. If a true synergistic (not merely additive) effect were present, small subtoxic doses of a mixture would be more effective than large doses of either one alone.

Such an effect was reported in test-tube and rabbit studies over a year

MARVIN BACHMAN: The arithmetic is crazy.

ago, but this spring Marvin Bachman, of CSC's research staff, showed that it also worked on human patients.

Two patients suffering from subacute bacterial endocarditis were unresponsive to large doses of penicillin, but they recovered dramatically when bacitracin was given along with penicillin. A third patient with the same disease had received many other antibiotics besides penicillin and had failed to respond; the bacitracin-penicillin combination cured him in a matter of days.

Upshot of the tests: CSC is bringing out Penitracin, a portmanteau trade name that combines the names of the two antibiotics that don't add up in the usual way.

ALKALI SEESAW

General chlorine-alkali price increase develops as four producers raise schedules.

TWO YEARS AGO caustic soda was a black market chemical. Last year it began to resemble an immovable object in alkali warehouses. Today much of this inventory has been moved by a combination of persuasive forces: greatly improved domestic demand, large exports to China at the end of 1949 (*CI, April 1950, p. 503*), and fair quantities now moving to the Argentine on a consignment basis.

With these developments caustic soda salesmen have shed the harried look they've worn for the past year. Remarks such as "Demand for caustic and chlorine are quite well balanced now," and "Our caustic soda inventories have been decreasing for some time," are quite common. And now four producers—Solvay Process Division of Allied Chemical & Dye Corp., Diamond Alkali Co., Columbia Chemicals Div. of Pittsburgh Plate Glass Co. and one other company which has not yet made its action public—have substantiated these comments by boosting the price of caustic soda, chlorine and soda ash approximately ten per cent. That "harried look," however, has only moved around the corner as is indicated by the fact that Columbia increased the price of only rayon-grade caustic soda. Although other producers won't commit themselves beyond saying they are "studying the situation," it looks like the price increase will soon be general.

Bonds Are Better

Main reason for the present upswing in alkali-chlorine prices is not hard to find: decreasing profit margins. One producer's postwar plant, for example, had such a poor first quarter that a like investment in government bonds would have yielded a greater profit.

But it is difficult to raise prices except in a strong market, and that's exactly what exists for chlorine and soda ash today. Pressing as the chlorine shortage (*CI, June 1949, p. 936*) is, however, it is more potential than actual: Some potential users, unable to obtain the material on a relatively free market, have had to curb plans in which it figured. And alkali manufacturers have been unwilling to expand plant capacity without a market for the caustic soda produced along with the chlorine.

Soda Ash Demand

Although soda ash has not been in short supply, the upward trend of its production rate indicates that capacity operation of existing facilities may soon be required. If the demand increases beyond that, trouble will really begin, for little expansion has taken place in soda ash capacity since before the war. Under the heavy impost of current construction costs, ash will have to be priced fifty per cent above today's quotations before any new plant capacity can even be considered. As *CI* noted last year (*June 1949, p. 936*), the time is not far off—four to five years hence—when soda ash demand will call for facing these facts.

Fortunately, there has been an increase in soda ash availability through shut-down of lime-soda caustic units. With new supplies of electrolytic caustic soda hitting the market each month, this has been the least costly and most obvious way of satisfying industry's demand for soda ash.

Not Spur Enough

Although the recent price increase has created a more favorable climate for the chlor-alkali industry, it is not sufficient to cause producers to increase their rate of expansion. They are still holding to present plans: new units being built by National Distillers Chemical Corp. at Ashtabula, O. (sodium plant); Niagara Alkali Co. at Niagara Falls, N. Y.; Hooker Electrochemical Co. at Tacoma, Wash.; The Dow Chemical Co. at Freeport, Tex., and another company at Niagara Falls; and a $6 million plant expected to be started soon by Mathieson Hydrocarbon Chemical Corp. at Saltville, Va. When these plants are completed, U. S. chlorine capacity, now 5500 tons per day, will exceed 5800 tons per day. Whether caustic supply swings high or low, industry probably won't set its sights on a higher production figure without a higher sales price.

CLEAN-UP COMMITTEE

Industry-wide task force masses for attack on stream pollution problems.

RIDDING our streams of health-menacing and otherwise objectionable industrial wastes is too big a job to be tackled on any but a nation-wide and industry-wide scale. That is the thinking behind the new National Technical Task Committee on Industrial Wastes, formed in Washington last month under the aegis of the U. S. Public Health Service.

Industry is already solidly behind the committee. It has designated 30 top-flight representatives to serve as a coordinating agency for technical subcommittees that will be made up from among 150 to 200 specially qualified men from the specific industrial fields most concerned.

Joint Enterprise

The committee's activities will be related closely to the broad program of stream improvement authorized by the Water Pollution Control Act of 1948. Although the act does not authorize direct financial aid to industry, it contains special provisions for Federal aid to industry through technical assistance on special problems and wherever the benefits of research can be made available.

For its chairman the committee selected Lyman Cox, waste disposal consultant to Du Pont and member of the Manufacturing Chemists Association's Water Pollution Abatement Committee. Dr. Harry Gehm, technical director, National Council on Stream Improvement of the Pulp, Paper and Paperboard Industries, was elected vice chairman, and Louis F. Warrick, chief of the Technical Services Branch, Division of Water Pollution Control, Public Health Service, as secretary.

Task Groups

The work of the committee is to be carried out by four major task groups, each comprising several sub-committees as follows:

1. *Food Industries*—canning, dairy, corn products, fermentation, distilling, beet sugar, meat.

2. *Mineral Products*—iron and steel, non-ferrous metals, coal mining, other mining, petroleum, by-product coke, gas.

3. *Chemical Industries*—textiles, pulp and paper, tanning, rubber, electroplating.

4. *General Industries*—automotive, electrical equipment, and, as representative of the many other smaller indus-

tries, the National Association of Manufacturers.

Summer Program

Stated objective of the committee is "to perform technical tasks pertaining to abatement of pollution by industrial wastes in cooperation with the Public Health Service and all others concerned with improving the quality of our water resources." As a first step in this direction the group set for itself three immediate tasks, with plans for their completion by next October when the committee will meet again in Cincinnati. These tasks are:

1. To assemble a source list of existing processes and practices employed in using, treating and controlling industrial wastes.

2. To assemble a tabulation of research projects concerned with the utilization, treatment and disposal of wastes, including those under way and those being contemplated.

3. To provide a list which will define problems that confront a given industrial group and for which there are no known satisfactory solutions. This list is to include particularly problems that are common to more than one industry.

To make its coverage industry-wide, the Committee is planning to invite the lumber, paint and varnish, cane sugar, food freezing, fish, and poultry industries, the railroads and the power producers, and any other groups who wish to join, to take part in the venture.

Model Law

The chemical industry more than once has come up against conflicting state laws as well as conflicting jurisdiction within a single state. It hopes the new committee will help to alleviate such conditions.

The Manufacturing Chemists Association is actively pushing for uniform legislation and has drawn up a model law which centers overall state water pollution control activities in a state water pollution control board. In addition, MCA is inaugurating a series of manuals on industrial waste treatment.

MORE POLYETHYLENE

ADDING impetus to the prediction (*CI, April 1950, p. 500*) of a polyethylene upsurge is Bakelite Division's decision to build a plant at South Charleston, W. Va. The new plant, to be completed in the Fall of 1951, will almost double Bakelite's current capacity. Carbide and Carbon will operate it.

THE GLAZE THAT STAYS

Silicone-based waxes and polishes take specialty spotlight as Boyle-Midway is first big polish maker to launch product.

CARS are somewhat brighter in Middletown, U. S. A., this month, and hearts are somewhat lighter in Pittsfield, Mass., and Midland, Mich. For Boyle-Midway, Inc., has just introduced its new silicone polish and cleaner, Autobrite, on a nationwide basis.

Having one of the largest wax manufacturers thus put its stamp of approval on silicones as polish bases can cause no gloom in General Electric Co.'s Chemical Department (Pittsfield) or in the Dow Corning Corp. (Midland), the only producers. This justifies the companies' cultivation of this market, explains the success of smaller polish manufacturers who have launched similar products on a more limited scale—and new businesses based on them. And it means that the other big companies in this highly competitive specialty field will soon be incorporating the new glamor materials in their products.

SILICONE POLISHES: New glamour in gloss.

Permanent Shield

Silicones have a unique combination of properties that enhances wax or polish formulations. The oils have extremely low surface tension which enables them to wet the surface and assist in dirt removal. Their water-repellency prevents formation of a continuous water film, thereby protecting against corrosion, and, being opaque to ultra-violet light, they eliminate one of the chief causes of paint deterioration. A silicone oil film has long life because it is stable in extremes of temperature—it resists oxidation and corrosion, doesn't yellow. Because of the excellent release characteristics of the oils, silicone polishes help keep dirt from sticking to a surface, make it easier to remove. And, important to the formulator, silicones lubricate carnauba wax, making it easy to spread. The wax is not reduced in hardness as it is with a soft plasticizer, and the silicone bleeds to the surface to afford extra protection.

To formulate a cleaner and polish without wax, silicone oil is combined with an abrasive and solvent. The silicone produces a gloss and leaves a protective film; the abrasive removes chalked enamel; and the solvent helps clean and remove the old wax and oil film.

A cleaner and polish with wax is formulated similarly, except that about 6 per cent carnauba wax is added. Here the silicone acts both as plasticizer and protective and gloss factor.

Omitting the abrasive from either of the above formulas will yield a polish instead of a polish-cleaner. The proportion of silicone depends upon the abrasive content since the latter is absorbent. Without abrasive two per cent is sufficient; with, 4 per cent.

Small Fellows First

Although it's difficult to say for sure which company was first in the field, there is no doubt that smaller manufacturers, aided by both Dow Corning and GE, pioneered in the development. The general public began to take notice when various silicone process finishes for automobiles were advertised first in the Los Angeles area. These jobs are considerably less expensive than the usual garage or service station car waxing, take but thirty minutes, and are claimed to last as long as the car. Siliconite Corp., Boston, for example, sets a price of $8.95 for its Siliconite process, the polish for which it sells to franchised dealers. It also retails pint cans for $2. (Boyle-Midway's Autobrite is 98 cents for a 12-ounce bottle, said to be enough for three cars.)

Early in the field was Tone Manufacturing Co., Grand Rapids, Mich. An outgrowth of research and development on silicone-containing furniture polish carried on by F. M. Curran & Associates, wood products consultants, for some members of the Grand Rapids Furniture Makers Guild, it was

formed in January, 1949. It was found that such products provided outstanding gloss and clarity, were very easy to apply, and didn't have the tendency to haze as did previously used materials. For well over a year Imperial Furniture Co. and other members of the Grand Rapids furniture community have been using the polish that was developed. Acceptance by these manufacturers encouraged the developers to retail the product, and this new venture led to the development of silicone solvent-vehicle type auto polish. Introduced in April, 1949, the latter is now being distributed in several states, and national distribution is planned.

The manufacturer with perhaps the largest assortment of silicone polishes is R. C. Carney, of Miami, Fla., whose Waxed Silicone Products, Inc., introduced its products in 1945, achieved considerable success when it entered the Los Angeles market about a year and a half ago. This company makes a base it calls "wax silicone" which is composed of oil, resin and other types of silicones in combination with wax. Wax silicone can be made into any form of polish—for autos, furniture, porcelain, or any surface that needs protection and will take a shine.

Carney's products are trade marked Sil-i-kleen, and he uses the slogan "automobiles gleam with Sil-i-kleen." He sells them in glass, metal cans, and drums in sizes from 2 ounces to drum lots, has national distribution "in a rather small way." Examples of his prices: A 16-ounce can of auto polish sells for $1.50; 6-ounce can of paste wax, $1.00. For automobiles, there is available buffing compound, wax seal, polish, paste wax, paste cleaner, glass polish, waterproofing; for the household: furniture creme polish, wax, metal-silverware-glass polish, and an insecticide (2 per cent chlordane, 3 per cent DDT with silicone film said to hold insecticide); and in the marine line: all-weather polish, metal cleaner and polish, and wax. Not content with that array, the company hopes to have a complete line of glass cleaners, leather polish, leather softeners, shoe polishes, etc.

More to Come

While the above enterprises represent new ventures, established manufacturers have not missed the potentialities in such products. Wilco Co., well-known Los Angeles automotive specialty manufacturers with distribution in eleven western states, has been working closely with Dow Corning for the last 18 months, last February added silicones to Wilco Auto Glaze Polish. Sales have boomed with the West Coast enthusiasm for the product. It also puts up private brand products for other companies.

Both Dow Corning and General Electric are enthusiastic about the future of silicones in the big wax market. Dow Corning's Sight Savers, the eye glasses cleaners impregnated with silicones, have been a retail success, and it is presently test marketing a silicone-coated dusting cloth for glass and furniture (*CI Newsletter, April 1950*). The company also developed an auto polish itself several years ago to explore market possibilities, and has recently assigned a team of engineers to evaluate its silicones for such applications. GE's information indicates that in addition to expansion in automobile polishes, silicones will be soon found in many furniture, shoe, floor and other polishes. Missionary work carried on by these producers is now beginning to pay off, as many polish manufacturers who several years ago were reluctant to use what they felt were relatively high-priced raw materials, are now turning to silicone.

Some of these companies won't say much about their plans, but the very nature of their business dictates that they will have to supply the growing consumer demand for silicone polishes. R. M. Hollingshead Corp., the Camden, N. J., automotive specialties firm, reports that it renewed its work on silicone polishes and waxes last summer, and came up with generally favorable conclusions about them. Samples have been sent out to its special brand customers, and production will get underway soon. Sizes of auto polishes will probably be 10-ounce and pint cans; selling prices somewhat higher than in present products.

ISOFLEX: Arealess points provide no path.

ACETATE INSULATION

Cellulose acetate laminate developed in Sweden now manufactured here.

ALTHOUGH it isn't as glamorous as Greta Garbo or Ingrid Bergman, a recent import from Sweden may create more of a splash in industrial circles.

The new import is Isoflex, a low-temperature insulation first manufactured in 1934. Since then facilities have been set up in nine European countries, and just last year a plant was built in San Francisco. Next on the expansion schedule is a plant in the Chicago area.

Isoflex consists of multiple laminations of a special cellulose acetate foil. Both types, standard and flexible, employ the multilaminar, corrugated foil construction; but in the former the corrugations of adjoining layers are at right angles, in the latter, 45° angles. Contacts between successive layers of foil are thus virtually arealess points (providing no conductivity). At these points the laminations are bonded to provide a firm construction.

Cellulose acetate was selected because it is not affected by water vapor or condensate. A filler is used to lower its thermal conductivity.

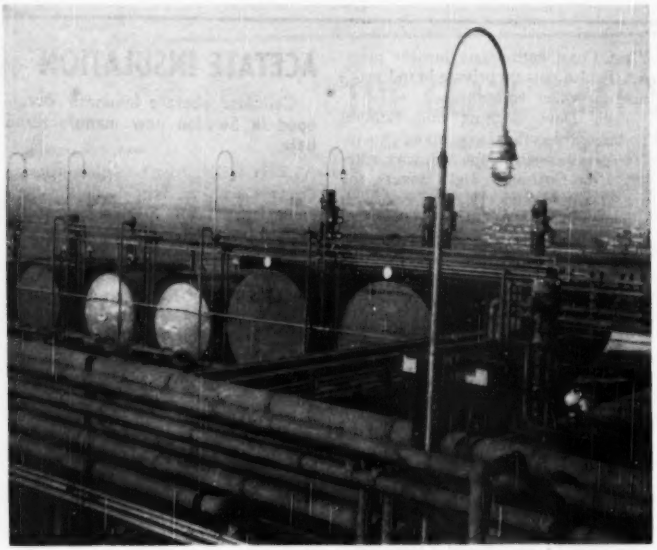
Light but Firm

High on the list of sales arguments is Isoflex's dimensional stability in spite of its lightness (50 lbs. per 1,000 board feet). Reason for the first is its method of construction, which makes a rigid but resilient structure that won't pack or shake down. Reason for the latter is the fact that, like many insulating materials, most of it is air. The foil is only 0.0015" thick, but the corrugations give it an approximate ¼" over-all thickness. A one-inch board, then, contains only four to six plies.

At the top of the selling points list, however, is the claim that Isoflex is absolutely unaffected by moisture and thus maintains a constant low conductivity. Condensate can drain readily by virtue of the construction, and moisture absorption is low.

Pinpointed Market

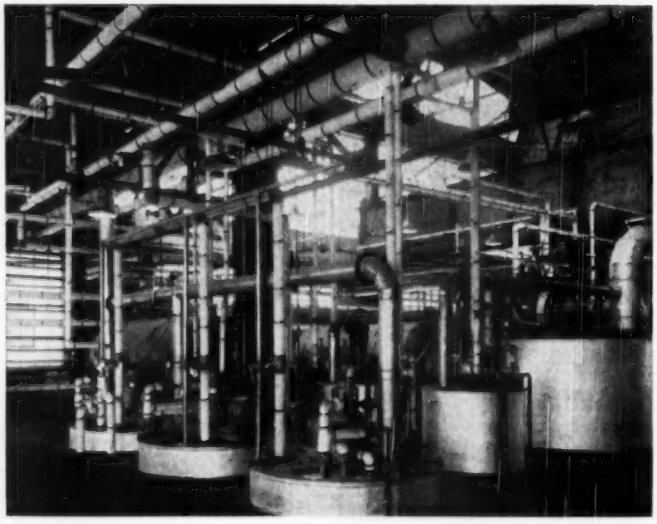
Because these advantages are particularly valuable in the low-temperature field, Isoflex Corp. is aiming its selling effort at builders of refrigerated railroad cars, trucks, and airplanes. Pacific Fruit Express and Borden Co., for example, are trying it on refrigerator cars and ice cream trucks, respectively.



1 RAW MATERIALS are stored in an extensive tank farm, part of which is shown above. Separate tanks and pumps for each of the products used at the plant prevent contamination.

Modern Technology Marks Metallic Soaps Production

by HOWARD C. E. JOHNSON, Managing Editor



2 THE PRECIPITATION method involves double decomposition of soluble salts to form an insoluble soap. Salt dissolvers and precipitation tanks are located on the upper deck.

MANUFACTURE OF PAINT DRIERS, now grown to a 35-million pound annual business, has graduated from rule-of-thumb to up-to-date batch-process engineering. Harshaw Chemical Co.'s new plant at Gloucester City typifies this progress.

THE new Harshaw Chemical Co. plant for the production of metallic soaps embodies the latest advances in process engineering. Constructed of stainless steel for the most part, and equipped with automatic controls, steps have been taken to insure the production of uniform, quality products with utmost attention to safety.

The plant is located on a 22-acre site fronting on the Delaware River at Gloucester City, N. J., with wharves affording accommodations for ocean shipping, and with a 30-car switch from the Pennsylvania, Reading and Seashore R.R. for loading and unloading of raw materials.

The brick and steel building housing the plant and storage has a total floor space of 125,000 sq. ft., with an inside height of 51 ft. which gives excellent vertical process room, and yields four operating decks made of open grating type of construction which assures adequate ventilation.

With seven different acids and thirteen different metal ions, simple mathematics indicate that 91 products are possible. Add to that the soaps containing more than one metal or acid and the possible number becomes many times greater.

Not all of these possible products are in demand but still a great many of them are manufactured by Harshaw Chemical Co. at Gloucester City. The great variety of items makes continuous operation impracticable, but modern engineering has made possible maximum efficient use of the plant equipment by batch processing.

The principal acids involved in Harshaw's operations are naphthenic, linoleic, oleic, octoic (2-ethylhexoic), and the fatty acids of rosin, soybean oil, and tall oil. The chief metals combined with these acids are cobalt, lead, and manganese; less commonly used are zinc, cadmium, calcium, aluminum, copper, iron, nickel, barium, tin and chromium.

RAW MATERIALS HANDLING

The organic oils, acids and solvents are pumped from tank cars direct into steam-heated storage tanks of 12,000 to 20,000 gallon capacity. The tank farm (Figure 1) is located a safe dis-

tance from the actual process building. The tanks are of mild steel, stainless steel or aluminum depending upon the material they are to hold. Where necessary tanks are equipped with agitators.

For safety most of the electrically operated pumps are located in a special pump house at a safe distance from the tank farm and the process building. Liquids are pumped from the tank farm to the process by a pipe line and pump used only for that particular material to avoid contamination. All reagent liquids are pumped into the process through 2000-gal. stainless steel weigh tanks.

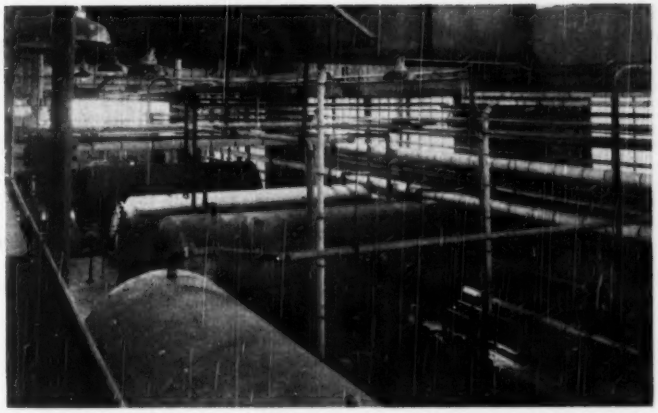
Dry materials are received in the usual standard containers, and stored in hoppers of the third operating deck in the process building. They are charged into the process through mechanical feeders. The hoppers and mechanical feeders are ventilated to a central dust collecting system. Reaction vessels are exhausted through the roof to eliminate hazardous fumes from the building. The entire process building is under suction with air inlets near the floor providing excellent ventilation approved by the New Jersey Industrial Commission and the Underwriters Laboratories.

Equipment motors and electrical equipment switches are all of the explosion-proof type. The switches themselves are located in an isolated control room with explosion-proof push buttons adjacent to the operation. A minimum of pumps are located in the operating area—actually only those required for transferring liquids in process and finished products for shipping.

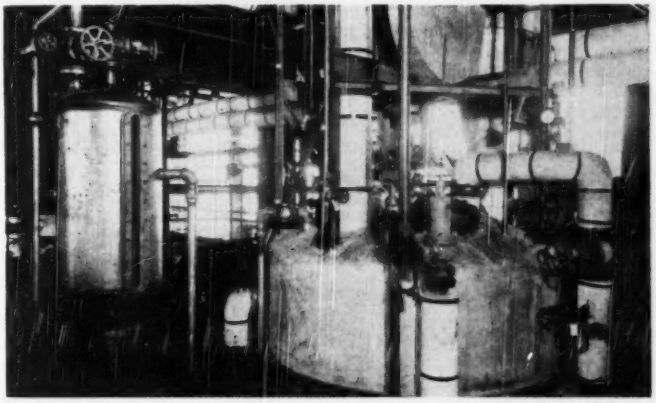
TWO ROUTES USED

The metallic soaps are formed by two alternative routes. The first is a simple double decomposition whereby the sodium salt of the acid reacts with a soluble salt of the desired metal—usually the chloride, sulfate, or acetate. The water-insoluble soap, which is the desired product, rises as a separate phase to the top. The aqueous layer, containing the soluble sodium salt (chloride, etc.) is drawn off from the bottom. The product layer is washed with water and then taken up in a suitable solvent. The remaining water is removed by heating under vacuum and the solution is filtered. Liquid products are adjusted to the proper metal content by addition of solvent and the material is run off into storage tanks or shipping containers.

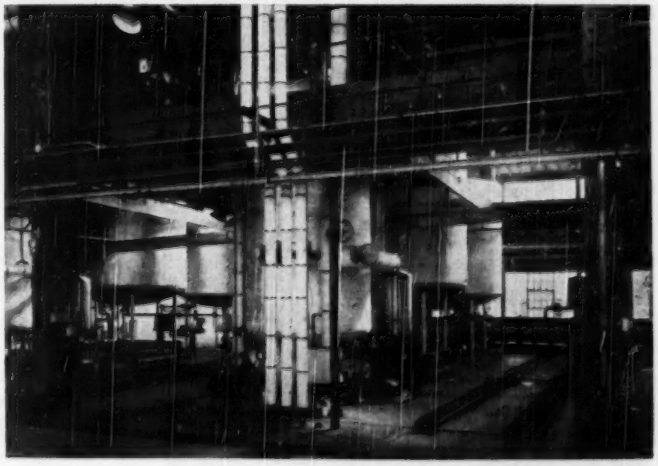
The second general method consists of neutralizing the fatty acid with the oxide or hydroxide of the metal. They are reacted by heating in a fusion kettle, the water of reaction is



3 THE FUSION method involves neutralization of a fatty acid with a metal oxide, hydroxide, or carbonate. Acids are measured into the fusion kettle by means of weigh tanks.



4 FUSION KETTLE is Dowtherm-jacketed, equipped for vacuum and agitation. Sight glass on condensate tank shows when reaction between acid and metal oxide is complete.



5 FUSION LINE seen from lower level shows kettle, weigh tank and hold tank in a row. Product is first pumped to hold tank, filtered, then pumped to weigh tank for analysis.

driven off by heat under vacuum and the product is filtered and subsequently handled as in the first method.

Harshaw uses its raw materials in the most readily available convenient form. Iron, manganese, aluminum, and chromium driers are made by the precipitation method, so the metals are processed as the sulfate or acetate. Calcium driers are made by either method, so both the chloride and the oxide are used. The other metals are used as oxides, hydroxides, or carbonates.

Either acids or oils are used depending upon various factors. Most are pure enough as received, but naphthenic acid is bought crude and distilled before use.

PROCESS DETAILS

Separate production lines are provided for the precipitation and fusion processes.

In the first, the salt is dissolved in water in a lead-lined steel tank equipped with steam coils and an agitator (Figure 2). The solution is filtered and pumped into a similarly equipped weigh tank. The fatty acid, meanwhile, has been run from weigh tanks (Figure 3) into the stainless-steel saponification kettle, also provided with steam coils and an agitator, and neutralized with caustic solution. The metal salt solution is pumped in and the precipitate washed free from soluble salts. Solvent is added to dissolve the product, and the solution is pumped to a fusion kettle for drying, filtering, and—in the case of solid products—stripping.

Three separate lines, each consisting of a fusion kettle (Fig. 4 and 5), a holding tank (Fig. 6) and a weigh tank, are provided for the fusion process. The 2500-gal. stainless-steel fusion kettles are Dowtherm-jacketed and provided with a variable speed hydraulic drive agitator and a steam ejector. Powdered metal oxide is added by a vibrating feeder to the fatty acid and solvent. At the elevated temperature part of the solvent and the water of reaction is distilled off and collected in special condensers (Fig. 7). Solvent is returned to the kettle and reaction is complete when the distillate is no longer cloudy.

The product is pumped into a 6000-gal. holding tank (Fig. 6) whereafter it is filtered and pumped into an equally large weigh tank for analysis and (for liquid products) adjustment of metals content. Liquid products are then run into storage tanks or shipping containers. Solid products, on the other hand, are discharged to the fusion kettle again, where the solvent is stripped and the molten material drummed.

Regarded as a distinct advance is the use of Dowtherm-heated kettles, replacing direct-fired kettles formerly generally used to a great extent. Dowtherm provides better control and therefore less darkening of the product; and since it provides high temperatures at low pressure it permits lighter and consequently cheaper kettle construction.

Plate filters are used throughout the process because of the diversity of products. They are considered easier to clean than other batch types, and continuous types would not be applicable to these operations.

Servicing the production units are a Dowtherm boiler, a steam boiler, and a solvent recovery unit. There is also a modern control laboratory for checking purity and concentration of raw materials and products. Liberal use of automatic controls and recorders also helps keep labor requirements at a minimum.

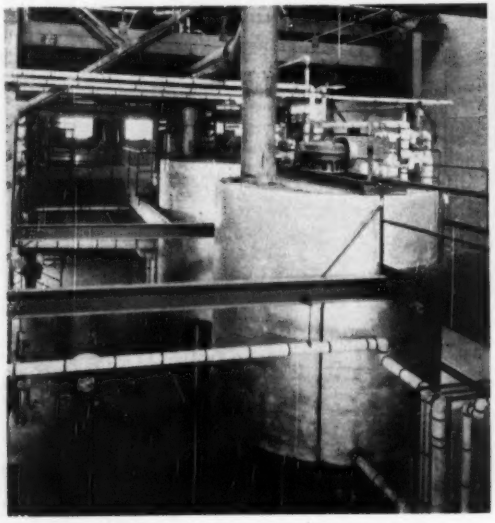
The handling of empty and filled drums is stream-lined. Four drums on a pallet are brought in by fork truck to the weigh scale (Fig. 6). Here the four drums are filled simultaneously, stencilled and picked up by the truck.

THREE MAJOR USES

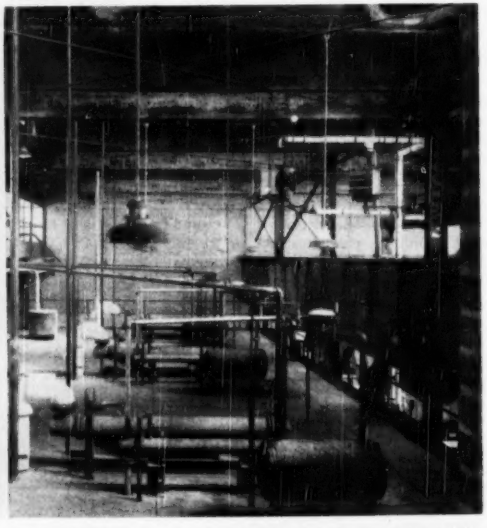
Metallic soaps are used widely as driers in paints and varnishes, oil cloth, floor coverings, and printing inks. In addition to these, copper salts are used as fungicides and wood preservatives, and lead naphthenate is a high-pressure grease additive.

Why so many different driers? One reason is cost. For some applications the cheapest driers (usually the resinates) are satisfactory; other uses require more expensive types (like soaps of 2-ethylhexoic acid). Then there are considerable differences in drying characteristics: Some dry the surface; others through-dry.

As driers these compounds are used in catalytic amounts—1 to 2% by weight. The present size of the industry—some 35 million lbs. a year—is thus an indication of the tremendous usage of printing inks, floor coverings, and drying oil-containing coatings.



6 AFTER ANALYSIS (and adjustment of metal content if necessary) liquid products are drummed, solids stripped of solvent.



7 CONDENSERS and surge tanks on top deck over fusion kettles. Hoppers hold metal oxides, added to kettles by vibratory feeders.

PHTHALIC ANHYDRIDE by TANK CAR

by B. E. THOMAS, Production Manager, Organic Chemicals Division
Monsanto Chemical Co., St. Louis, Mo.

Producers and users save as phthalic joins ranks of solids shipped in tanks.

SINCE the end of the war, increased labor and material costs have made manufacturers more diligent than ever in their search for ways to boost the efficiency of their operations. One result of this searching has been an increase in the handling and shipping of materials in bulk.

In line with this, Monsanto Chemical Co. last fall initiated the shipment of liquid phthalic anhydride in tank cars. Handling phthalic in liquid form stems from experience obtained at the Monsanto Queeny Plant in St. Louis that extends back to 1934.

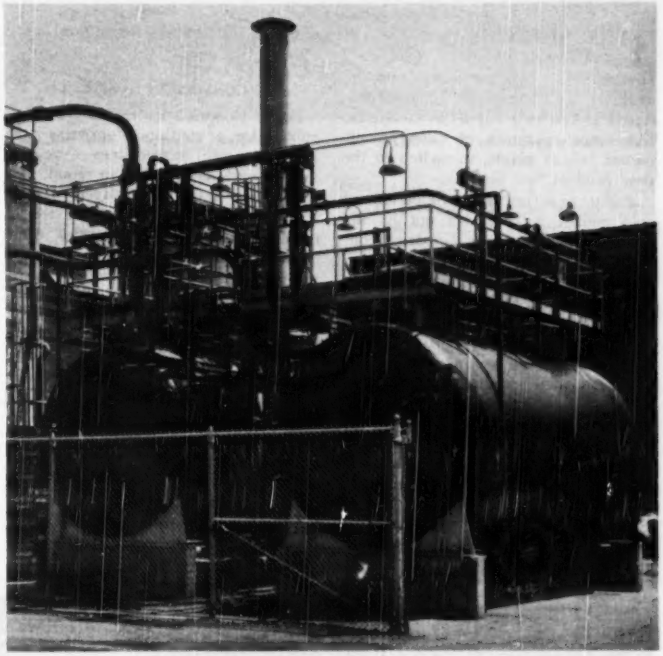
HALF A CENT A POUND

Phthalic anhydride is produced in a molten state and the finished product is handled as a liquid up to the point of packaging. There the melt is cooled, flaked and bagged. If the phthalic is shipped in a molten state, cooling, flaking and bagging can be eliminated, with resultant savings of as much as a half a cent a pound. This lower cost, which is reflected in price, becomes the user's first saving.

Further savings result when the user introduces the molten phthalic into his own process. The operations of bag dumping and melting are eliminated. Also, in molten form the phthalic enters the process equipment at a temperature closer to the reaction temperature, thus permitting a reduction in overall reaction time. Some users have reported as much as 10% increase in existing plant production capacity over that obtained with flake phthalic.

Bulk handling also shows up in practice to be an important warehouse economy by eliminating the need for inside storage space. With phthalic anhydride in outside storage tanks, warehouse areas formerly required for the bagged solids are made available for other purposes.

Still another advantage is that pipeline handling allows transfer of the material with essentially push button control, a smoother operation than conveying by manual or mechanical methods. Since the phthalic is confined from the time it is received until it is delivered to the reactor, there is less inherent hazard from vapors, fume, and dust in the working areas.



Storage tanks for bulk loading of liquid phthalic anhydride (each 120,000 pound capacity).

For nearly half of the 34 years Monsanto has been making phthalic anhydride it has been using iron pipelines and tanks for in-plant transfer of the material.

SHIPPING AND STORING

Molten phthalic is now being shipped in regular 10,000-gallon all-iron tank cars, as well as cars of other convenient sizes. On a basis of 10 lbs./gallon, each 10,000 gal. car represents a shipment of 100,000 pounds. Even in ordinary, uninsulated coil cars, the solid phthalic melts out in less than 48 hours. During the past winter season, regular uninsulated tank cars were melted out in less than this time in the New York area.

Currently under development by Monsanto is a special semi-steam-jacketed tank car carrying 6" of insulation, to be put in service in late summer. The jackets are to prevent accidental steam contact with the phthalic, to accelerate the heating and melting operation, and to permit long distance shipping without appreciable solidification.

Tank trucks are being used to deliver liquid phthalic in some areas to customers whose requirements are less than carload quantities. Radius of delivery of tank truck shipments is conditioned to some extent by the need to have the phthalic remain in a molten state. For such shipments, stainless steel tanks with their lower tare weight are preferable.

(Turn to page 847)

Goodrich's Cold Rubber Changeover Shows Advantages of Continuous Process

LATE LAST YEAR B. F. Goodrich Chemical Co. switched from batch to continuous production of cold rubber. Experience to date demonstrates advantages of continuous operation.

THE SUPERIOR properties of "cold" GR-S rubber (polymerized at 41° F) as compared with the ordinary "hot" synthetic rubber (produced at 120° F) led B. F. Goodrich, like other operators of Government-owned rubber plants, to switch to the new product last year.

Early experimental production of cold rubber was carried out by the batch method, so when Goodrich converted half of its 60,000-ton operating capacity to the new product in August, 1949, the Office of Rubber Reserve insisted on batch operation. Contemplating a switch-over to continuous operation as soon as possible, Goodrich was permitted, however, to install equipment that would facilitate such change.

It was only a couple of months later, as a matter of fact, when one of the two production lines was converted to continuous operation, and later in October the second line was similarly converted. Goodrich has since built a very similar third production line designed initially for continuous operation.

CONVERSION SIMPLE

Since Goodrich had made the 120° rubber by a continuous process and since the cold rubber lines were designed with conversion in mind, the switch-over was comparatively simple.

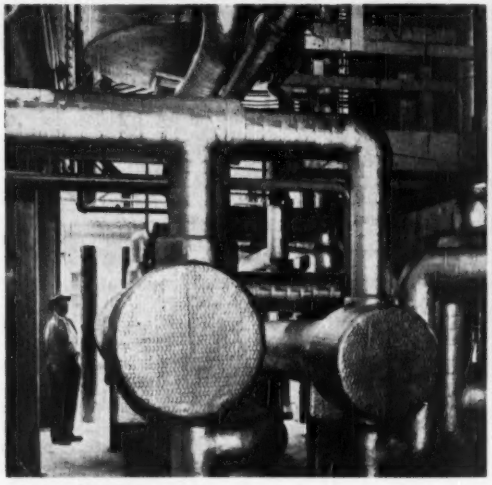
The polymerization line consisted of twelve 3,750-gal. reactor kettles, each of which was operated before as an individual unit; i.e., the kettles were loaded with butadiene and styrene, soap, modifiers, and catalyst, and polymerization was continued until the batch was ready, whereafter it was discharged to the blowdown tank. Thereafter the latex is stripped of unreacted monomer, coagulated, dried, and prepared for shipment.

Now the twelve tanks are connected in a series, the first tank discharging into the second, the second into the third, etc., until the finished latex is discharged from the twelfth tank. Ten displacement tubes at the end of the line of flow provide for change of retention time of the reaction mix when a small change in reaction time is necessitated to maintain product uniformity.

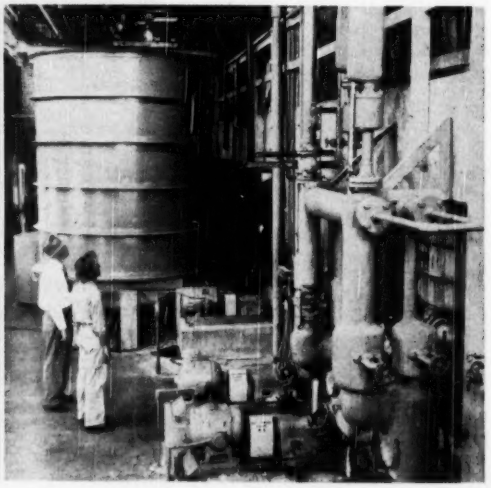
After several months' operation, several advantages of continuous operation have become apparent.

First of these is simpler equipment. The batch process required larger pumps, meters, and heat exchangers, for the materials had to be added quickly. Instrumentation of the continuous process is simple: Major ingredients (butadiene, styrene, soap) are added through rotameter controller-recorders, which are calibrated every hour; minor ingredients (catalyst, modifiers) are measured in by proportioning pumps. Instruments on the kettles consist of temperature recorders, on both the reaction mixture and the cooling brine, and a pressure recorder on the reaction mixture.

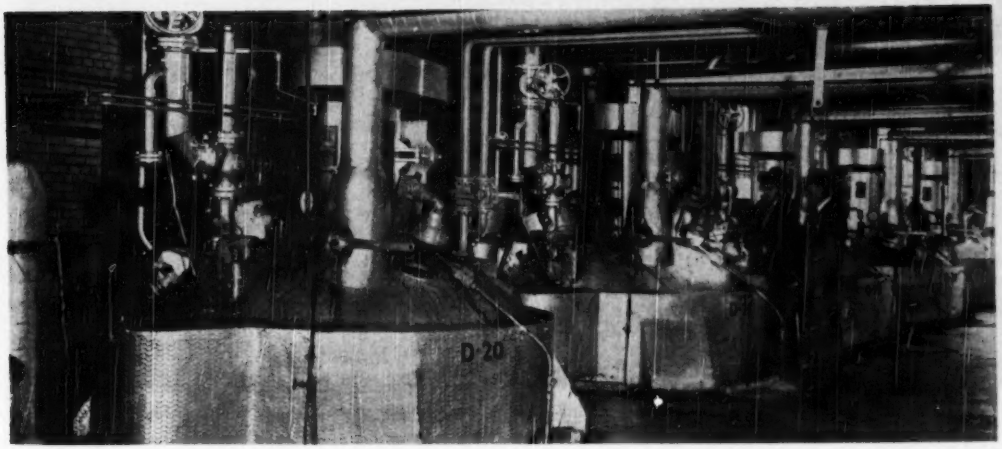
Another important equipment advantage is brought about by the more uniform refrigeration load possible with continuous operation. About 25% of the total refrigeration load is required to cool down the raw materials before they are charged into the reaction kettle. With batch operation this load is not spread uniformly as in continuous



IN BATCH processing large unit on left was needed to cool soap and activator solutions, smaller unit on right to cool monomers. In continuous process, smaller unit serves to cool entire feed stream.



ACTIVATOR and soap solutions are pumped from pigment preparation area. Large tanks on left holds finished activator solution, which is added to continuous process system by proportioning pump.



GLASS-LINED, jacketed, 3,750-gal. reactors are insulated with 5" cork. Twelve such reactors constitute a continuous-process line.

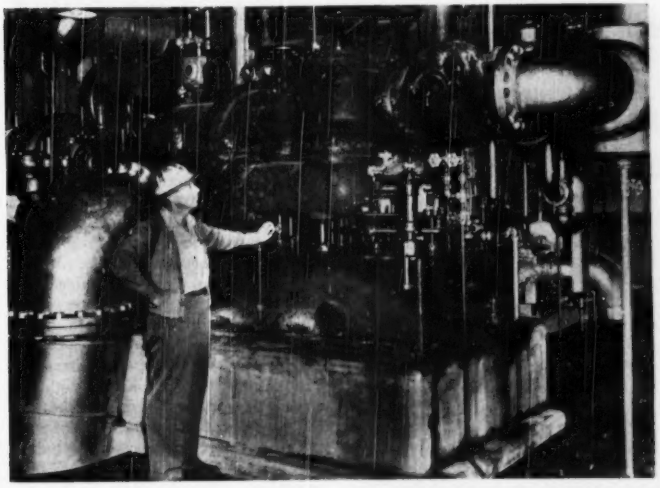
operation over the entire day but comes intermittently whenever a batch is being charged. To handle this surge load requires about 25% greater refrigeration equipment for batch operation. Also not to be overlooked is the operational disadvantage of steam surges caused by this refrigeration surge inasmuch as the refrigeration machines are steam turbine driven.

Second advantage is lower labor requirements. Filling and emptying of the individual kettles required much more work than the continuous process. Also, each batch had to be individually analyzed, requiring more technical labor. Goodrich estimates its labor saving at about 50 per cent.

The time saving on charging and discharging is partly responsible for the third advantage: higher capacity. Another factor here is the fact that actual capacity of the system is greater. The kettles themselves are 100 per cent full as against 90-95 per cent for batch operation. Also, the displacement tubes add capacity equal to an extra kettle. In all, the capacity is 30-35 per cent greater. A somewhat slower reaction, however, cuts down the actual increase in output to about 3 per cent.

Other advantages are a better, more uniform product and lower power requirements. Continuous blending of the several ingredients results in a more uniform latex, and complete exclusion of air—inherent in the continuous process design—gives a better product. In the batch process, temperature and volume changes sometimes led to the creation of a slight vacuum in the kettle, and the resultant ingress of air was deleterious to the product. Better temperature control also contributes to higher, more uniform quality.

The polymerization step takes 15-18 hours, after which time the reaction has reached the desired 65 per cent completion (compared with 72 per cent for "hot" rubber). Goodrich claims that it is easier to achieve conversions over 60 per cent with the continuous process than it was with the batch method.



STEAM TURBINES drive compressors for the refrigerant. Entering at 15 pounds per square inch (gauge) and exhausted under high vacuum, the steam gives up maximum thermal energy. An advantage of continuous vs. batch processing is somewhat lower power requirements.

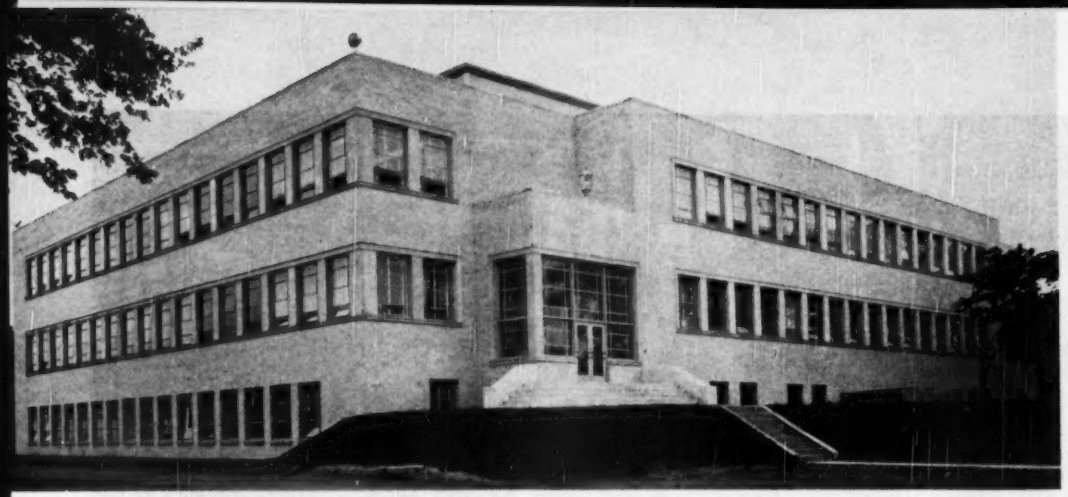
IMPLICATIONS FOR OTHERS

Goodrich's experiences with cold rubber suggest that other processes might profitably be switched from batch to continuous operation. William I. Burt, Goodrich vice-president in charge of manufacturing, outlines some of the factors to be considered:

First of all, a large volume of output is required to justify a continuous process. Production in terms of 10,000 lbs. a month—or even 100,000 lbs. a month—doesn't lend itself to continuous production, for it isn't possible to get accurate proportioning or uniform reaction at such low rates.

Then, gases or liquids are more adaptable to continuous processing than solids. Better flow and consequently more intimate and uniform blending of reactants is achievable with fluid ingredients.

Lastly, the product must be the same, day in and day out. Changes in raw materials or in proportions of raw materials make continuous operation completely impracticable. Thus, continuous operation lends itself best to standard, large-tonnage products.



EXTERIOR of Solvay Process Division's new alkali research and technical service laboratory at Syracuse, N. Y.

New Lab for Alkali Research

LATEST DESIGN FEATURES are embodied in Solvay Process Division's million-dollar alkali research and technical service laboratory at Syracuse.

COMPLETED within the past year as part of the multimillion-dollar postwar expansion and rehabilitation program of The Solvay Process Division, Allied Chemical & Dye Corp., the new alkali Research and Technical Service Laboratory at Syracuse, N. Y., was formally opened late last month.

While no radical departure from current practice is represented either in materials of construction or arrangement of units, company officials chose among various alternatives to provide the best set-up for the type of research work envisioned.

Of concrete and steel construction faced with buff-colored brick, the three-story building has a total floor area of about 40,000 sq. ft. It is U-shaped, 175′ long with wings 120′ and 100′ long, respectively. There are laboratory rooms on all floors; in addition, the first floor contains storage rooms, machine shop, and building services; the second, research offices, library, and stockroom; the third, technical service offices and analytical laboratory. A penthouse extending over the front section and one wing houses the electrical distribution system, hood fans, ventilating fans, and distilled water production and storage.

MODULE SYSTEM

Modules of 6′ x 21′ are combined to form laboratories of the desired size. Two sizes are repeated frequently throughout the building: One of these, 12′ x 21′, is designed for use by one or two researchers; the other, 18′ x 21′, is normally occupied by two to four workers. Laboratories for special services, such as the analytical laboratory, are multiples of still more modules.

All laboratory areas are serviced by vertical shafts running the entire height of the building and into the penthouse. These shafts contain electrical, plumbing, and ventilating services, and make it possible to provide new or additional services to any room with a minimum of disruption. Each of the laboratories is supplied with hot and cold water, distilled water, 50-lb. steam, gas, compressed air, and 115-230-volt 60-cycle AC. In some rooms 440-volt 3-phase power is available. Fluorescent lights provide 35 foot candles of illumination at desk tops.

Safety provisions include a shower and carbon dioxide fire extinguisher in each room. Larger extinguishers and fire hose are available in each of the corridors. Automatic sprinklers are provided in storage rooms and in areas where unusual fire hazards may exist.

CLEAN AIR

On the question of laboratory air conditioning (*CI, November 1949, p. 726*), Solvay officials felt that Syracuse's moderate climate didn't justify refrigeration of the air. But adequate ventilation is provided by intake of 50,000 c.f.m. of fresh air, which is passed through mechanical filters and electrostatic precipitators before being forced into ducts which lead to all parts of the building. The air is heated, of course, in the winter, and convectors in individual rooms permit occupants to adjust the temperature to their liking.

Air is withdrawn through the hoods and service shafts, all of which are provided with suction fans in the penthouse. Total capacity of all exhaust fans is less than that of the input fan, so a slight pressure exists within the building at all times. Windows can thus be opened without danger of dust blowing in.

Metal laboratory furniture is used throughout the building, and working surfaces are of alharene stone. Waste lines serving the sinks and other drains in the laboratory rooms are of Duriron. Walls are plaster, and floors are asphalt tile.

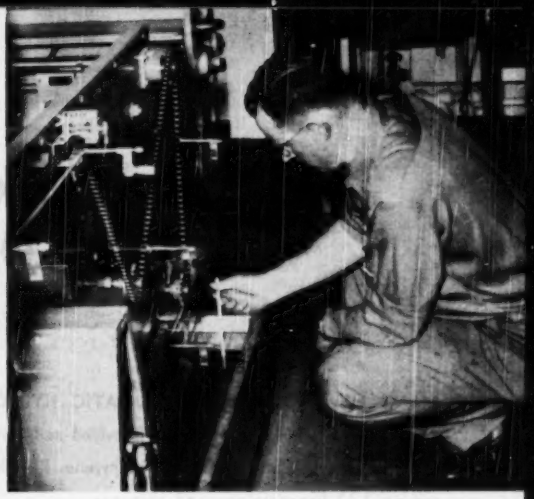
Walls are rigid rather than movable (*CI, September 1949, p. 352*). It was felt that the variation in room size gave enough flexibility for the type of work carried out. The walls are not load-bearing, however, so they can easily be knocked out if the occasion arises.

The 7,000-volume library is equipped to double as a meeting room. A folding wall allows one end to be closed off for smaller meetings, and provision is made for projecting motion pictures and slides.

Special laboratories provide for study in Solvay's fields of interest. A paper laboratory is equipped to duplicate paper-making from the wood chips to finished sheets. Another laboratory studies bottle-washing with detergents. A bacteriological laboratory studies germicidal properties of detergents, and another one studies grinding and compounding of such materials.

A large room on the first floor is devoted to pilot plant-type set-ups.

LIBRARY in new laboratory building can be easily converted to meeting room.



DETERGENT lab can duplicate commercial bottle washing.

Other similar set-ups are located in the various plant units, but research men follow processes through from initial experimentation to commercial operation.

CLEARLY DEFINED

Solvay could design its new laboratory with greater assurance of its functionality than many other companies, for its research activities can be more clearly defined than is usually the case.

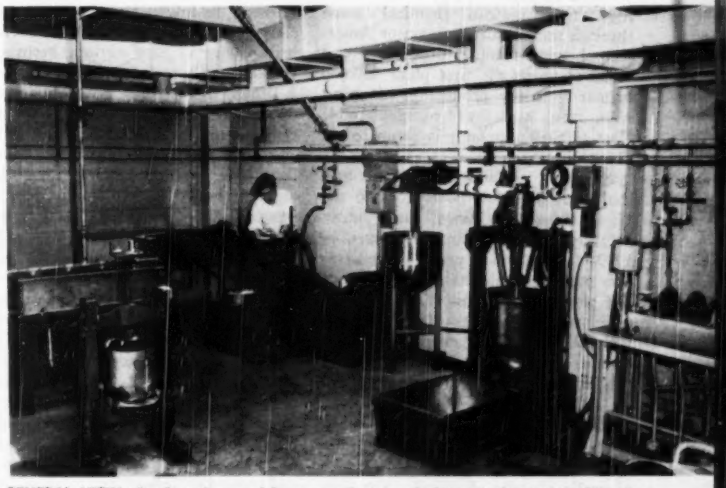
Solvay's activities fall into two general categories, alkali and nitrogen derivatives, and each section has its own research facilities. The latter is located at Hopewell, Va. Both at Syracuse and Hopewell a chief of research and a chief of engineering report to a director of development who coordinates research and engineering functions. The two directors report to Solvay's vice-president in charge of research and development, who coordinates the alkali and nitrogen sections.

The laboratories of the Allied's divisions emphasize work in their own particular fields of production and related fields. Nevertheless, each of the divisions is expected to develop and carry forward a fundamental, long-range research program of its own. The Allied Central Research Laboratory at Morristown, N. J., supplements the division laboratories and also carries on independent work in new fields.

Although alkali technical service shares research facilities in the new building, the two staffs are entirely separate. Information is liberally exchanged between them, of course, for many research ideas evolve from technical service problems. Sharing facilities thus enables research to keep in touch with changing needs of the innumerable alkali-consuming industries, providing plenty of ideas for future investigations.

PAPER AND TEXTILE testing room requires constant temperature and humidity for accurate data.

SAMPLE SHEETS of paper are manufactured in the pulp and paper laboratory.

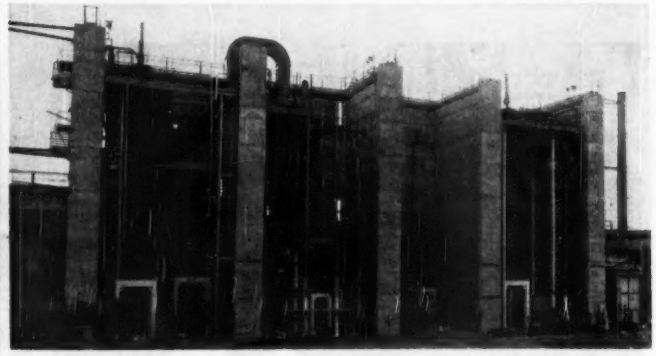


GENERAL VIEW of pulp and paper laboratory, where wood chips or other papermaking materials can be carried through digestion, beating, screening, bleaching, etc., to finished sheets.

Production of Specialty Chemicals by COAL HYDROGENATION

by PETER W. SHERWOOD
Koppers Company, Inc., Pittsburgh, Pa

MANY NEW POLYCYCLIC AROMATIC HYDROCARBONS, hitherto not available commercially, will be provided as by-products of the hydrogenation of coal. Major ones will be pyrene, 1,2 dihydropyrene, 4-methyl pyrene, 1,12 benzperylene, and coronene.



HEAVY REINFORCED CONCRETE STALLS enclose the converters, which operate at pressures up to 10,300 psi, at the Bureau of Mines Coal Hydrogenation plant at Louisiana, Mo.

HIGH-PRESSURE hydrogenation of coal and coal tars, which furnished nearly half of Germany's wartime gasoline supply, is now entering the American chemical scene through the backdoor. A major American chemical manufacturer is reported to be planning the first plant devoted primarily to the production of chemicals from coal by hydrogenation.[11] Cost of this pilot unit is estimated at $10 million.

However, credit for America's first coal hydrogenation plant goes to the U. S. Bureau of Mines, which began operations at Louisiana, Missouri, in 1949. Built primarily for demonstration purposes, this 200 bbl./day gasoline plant lays no claim to commercial or economic soundness. If gasoline or fuel oil is to be the main product, a commercially successful plant must produce 10,000 bbl./day.

CYCLIC ORGANIC CHEMICALS

The situation is different if the process is used primarily for manufacture of cyclic organic chemicals. Not only is the capital investment per ton of coal smaller, but chemical products of high unit value—both actual and potential—are obtained. At present the main obstacle to this application of high-pressure hydrogenation is an insufficiently developed market for the chemical products. Also certain recovery problems still remain unsolved.

When employed for the manufacture of gasoline, coal hydrogenation is carried out in two steps. The first, operated in a slurry-like liquid phase, reduces the molecular weight of the highly polymeric feed stock to approximately 200. The second stage—the vapor phase—further splits the product to an average molecular weight of about 100.

The liquid products of coal hydrogenation are predominantly either aromatic or naphthenic. The secondary elements (sulfur, oxygen, nitrogen) are negligible. The principal products of the vapor phase—benzene, toluene, xylenes, and higher aromatics and their hydrogenated derivatives—are now produced by both the petroleum and coal tar industries.

The situation is quite different in the first phase. Here a minor refining allows a rich harvest of oxygen- and nitrogen-bearing chemicals. At the same time significant amounts of highly condensed cyclical hydrocarbons are found, some of which are now unavailable in quantity from any other source.

Depending primarily on the nature of the raw material, the liquid phase hydrogenation runs at 4,400-10,300 psi. Operating temperature is about 900° F. Finely ground coal and catalyst are mixed with recycle oil. This "coal paste" is preheated to reaction temperature and injected into the bottom of the high-pressure converters. At some point along the preheating path, the charge is joined by a stream of high-pressure hydrogen.

After a hold-up time of one-half to two hours (depending on the desired product), the charge leaves the converters. A primary phase-separation between hydrogen plus volatile organic materials from the heavy oil takes place in a "hot catchpot" at full pressure and slightly below reaction temperature. The overhead is cooled for the separation of hydrogen from an oil, most of which can be charged to the vapor phase. For chemicals production, this oil and the associated water phase is particularly interesting for the tar acids, tar bases, and light chemicals it contains.

H.O.L.D.

The hot catchpot condensate, known as H. O. L. D. ("heavy-oil let-down"), is cooled and released to atmospheric pressure. Rich in ash and insoluble matter, this material must be processed by filtration, or more commonly centrifuging, and low-temperature carbonization. The purified oil is used for coal paste preparation and recycled to the liquefaction stage. This H. O. L. D. is rich in highly condensed polycyclic aromatics whose recovery has attractive potentialities.

In essence, primary coal liquefaction is the partial breakdown of the polymeric charging stock into highly unsaturated fragments which are prevented from repolymerization by almost immediate saturation with hydro-

gen. The primary breakdown products are themselves subject to further splitting, and the entire gamut of possible chemicals, ranging all the way down to ethane and methane, is produced.

Proper regulation of operating conditions minimizes formation of hydrocarbon gas and liquid-phase gasoline (which is of inferior quality). The lion's share of the product is in the middle oil range (180-325° C.) in preparation of a satisfactory feed to the vapor phase.

Reduction of the contact time or temperature (or both) increases the production of higher molecular weight oils. Thus the versatility of the process makes itself felt. In Germany, for example, high-pressure hydrogenation was employed commercially at Blechhammer for the manufacture of navy-grade Bunker C oil, while at Ludwigshafen an ash-free oil rich in bitumen (for conversion to electrode coke) was produced.

This versatility is particularly significant in the production of chemicals. Thus the most interesting chemical products, which are in the heavier oil fractions, can be manufactured at will. As expected, hydrogen consumption is an inverse function of the product's molecular weight. Accordingly production of heavy oil results in a significant decrease in requirements for costly hydrogen.

A striking characteristic of liquid phase products is the close resemblance which they bear to the raw stock. The reason for this is the low concentration of catalyst in the primary stage. Mild thermal breakdown occurs, but the prevailing conditions are not drastic enough to bring about a pronounced change in the fundamental structure of the material. If, for instance, a low temperature carbonization coal tar is hydrogenated, the gasoline-range fraction is found to have essentially the same specific gravity, aniline point etc., as the corresponding fraction of the untreated tar. While primary coal liquefaction can change the quantitative distribution of the product's boiling-range spectrum, its effect on the qualitative characteristics is not so significant.

Due to limited refining action of the liquid phase, about 20% of the original oxygen and sulfur and 50% of the initial nitrogen are in the primary oils of commercial coal hydrogenation, in which the main product is middle oil. While actual data are missing on refining when the liquid phase is operated to form heavier products, it may be safely assumed that a richer yield of oxygenated and nitrogenous chemicals will be obtained. These are the most attractive conditions for use of coal hydrogenation to make chemicals.

Most of the reduced oxygen appears as water or carbon monoxide and dioxide. More value is attached to the ammonia, which can be recovered from the hydrogenation gases and liquors in huge quantities. Hydrogen sulfide from the same sources may serve as raw material for sulfuric acid.

To what extent the expected higher oxygen content of lightly hydrogenated oils will occur in the form of useful products is not known. In light fractions (gasoline range), considerable quantities of phenols and even more cresols are found. These accumulate in the aqueous phase and the light oil distillates of coal hydrogenation. Their recovery has been discussed by the author elsewhere.[1]

Tar acids in the higher-boiling fractions are less prevalent. Thus, Heyn and Dunkel[2] have shown the following distribution of tar acids from the products of hydrogenation of a Lower Silesian Coal:

Boiling Range °C.	Pressure mm Hg	% Tar Acids
To 180	760	18.0
180-220	760	34.2
To 150	15	14.1
150-190	15	6.1
190-230	15	3.2

The reason for this variation is the much lower stability of polycyclic (and polyhydric) tar acids compared to phenol and cresol. Once a polycyclic tar acid, such as naphthol, is exposed to the conditions of pressure hydrogenation in the presence of a weakly hydrogenating catalyst, it is quickly reduced to the parent hydrocarbon (naphthalene) followed by nuclear hydrogenation, isomerization and ring opening. Without a catalyst, naphthol undergoes condensation.[3]

Nevertheless, the oxygen content of the higher oil fractions is appreciable. A bituminous coal, which had been liquefied in a commercial plant (for primary liquid-phase production of middle oil), showed an oxygen content of 3.9% in its middle oil.[4] The existence of carboxylic acids under conditions of high-pressure hydrogenation is unlikely. Most of the oxygen in these fractions is probably tied up in fairly stable aromatic ether linkages of the diphenylene oxide type which, upon scission, yield phenol and hydrocarbons. Acetone and methyl ethyl ketone in liquid-phase gasoline were a source of commercial profit at the Leuna (Germany) hydrogenation works.

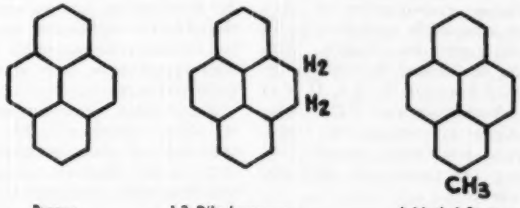
The greater part of unreduced nitrogen is apparently found in heterocyclic linkage. Pyridine, picolines, and quinoline are present in recoverable amounts, principally in the middle oil fraction. Acetonitrile has been identified in liquid-phase gasoline.

BY PRODUCTS

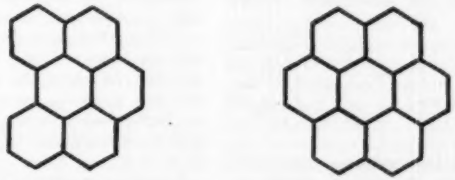
The recovery of byproduct tar acids, bases, etc., from coal hydrogenation oils and liquors may, under suitable conditions, be profitable. It is doubtful, however, if erection of a coal hydrogenation plant is warranted for the preferential production of these chemicals which are already available at low cost and in currently adequate quantities. The great attraction in coal hydrogenation is the comparatively large yields of symmetrical polycyclic aromatic compounds, which are not now available in commercial quantities.

Comparatively little work has been done on the identification of recoverable compounds of this type which are present in hydrogenation liquors. The accompanying table lists the most prevalent five of these products.

Associated with these high-boiling



	Pyrene	1,2 Dihydropyrene	4-Methyl Pyrene
MP °C	150	132	143
BP °C	371	360	396



	1,12 Benzperylene	Coronene
MP °C	273	432
BP °C	500	525

products of coal hydrogenation are smaller amounts of anthracene, fluorene, chrysene, benz-chrysene, benzcarbazole, and phenanthrene, plus numerous other polycyclic aromatics and alkylated derivatives, as yet unidentified.

Among heterocyclics, symmetrical highly-condensed aromatics of the naphthoxanthene, carbazole, and diphenylene sulfide types predominate.

These symmetrical aromatic compounds are prevalent in the products of hydrogenation because of their chemical stability. The first step in most types of destructive hydrogenation of aromatic compounds appears to be the saturation of the nucleus. With increasing molecular weight, the aromatic naphthene equilibrium shifts, however, more and more to the side of the aromatics. It has, moreover, been shown that particular stability (and low negative heat of formation) is associated with compounds which contain three or less adjacent CH groups in the ring.[5] This latter characteristic would explain the high ratio of such compounds as coronene and pyrene to anthracene and chrysene in the hydrogenation oils.

An exception to this last rule is carbazole, which is characterized by particularly high stability in spite of the occurrence of 4 adjacent CH groups in its structure. In fact, this property can be used to advantage in the separation of carbazole from anthracene by destructive hydrogenation of the latter.[9] The high stability of carbazole is probably due to the pyrrole ring.

The greatest concentration of pyrene and coronene-type chemicals is in the overhead oils from the low-temperature carbonization of H. O. L. D. A portion of these chemicals is probably formed as thermal breakdown products during carbonization of more complex compounds contained in the heavy hydrogenation sludges. Thus, according to Boente,[6] the vacuum distillation (1-2 mm) of H. O. L. D. from pitch hydrogenation gave 0.25% coronene. Upon low-temperature carbonization at atmospheric pressure, the remaining oil yielded an additional 1.25% coronene.

The following polycyclic aromatics were identified in the kiln (low-temperature carbonization) oil obtained in bituminous coal liquefaction at 4400 psi:[7]

	In Kiln Oil	*Referred to 1,000 tons Pure Coal*
Carbazole	app. 1%	1.7 tons
Pyrene	" 8-10%	14-27 tons
Pyrene homologues	" 1-2%	1.7-3.4 tons
Benzperylene	" 0.1%	0.2 tons
Coronene	" 0.5-1%	0.8-1.7 tons

There is some evidence that formation of these chemicals is greatly reduced with increasing hydrogen pressure in the liquefaction phase. Operation in this instance was for the primary production of middle oil in the liquid phase.

Recovery of polycyclic aromatics from hydrogenation oils on an industrial scale is expected to present some major problems. Separation is possible by fractional distillation and crystallization. Thus, fractional vacuum distillation of low-temperature carbonization oil in a good column will yield a cut of 2° C. boiling-point range in a once-through operation. Carbazole, pyrene, methyl and dimethyl pyrene can be separately crystallized[5] from this. By filtering and washing with a benzol-alcohol mixture, the crystals are recovered in essentially pure form.

Benzperylene and coronene can also be obtained by vacuum distillation of the high-boiling oils followed by fractional crystallization from xylene. Coronene can be isolated by an alternative method involving precipitation from a benzol solution of the high-boiling fractions (400° C. +) by petroleum ether. Separation of coronene from co-precipitated solids is possible by taking advantage of the ease with which it sublimes. Still other separating methods take advantage of the high resistance to nuclear hydrogenation exhibited by coronene.

POTENTIAL IS LARGE

A virgin field of great potentialities exists for these condensed polycyclic aromatics. As yet, only comparatively few market outlets have become known. Thus, coronene has been found to be a valuable intermediate in the production of vat and sulfur dyes, characterized by an unusual degree of light fastness.[8] Special use may also be made of its pronounced fluorescence and phosphorescence.

Similarly, carbazole—available today from coal tar sources—can be employed in the manufacture of dyestuffs and for the production of the pesticide, tetranitrocarbazole, and of polyvinyl carbazole, a plastic.

Major potentialities for pyrene are still fairly unexplored. The possible availability of these materials at low cost should, however, stimulate research on their applications.

A variety of alkylated naphthalenes and other lighter aromatics are associated with these products and may be expected to find markets once they become available at a low enough price.

Hydrocarbon gases are an unavoidable byproduct of high-pressure hydrogenation. Whether the manufacturer of these gases as principal products of high-pressure hydrogenation will ever be economically justified remains to be seen.

Extensive experience in the production of liquid fuels by coal hydrogenation has taught that the distribution of hydrocarbon gases formed in the liquid phase is surprisingly independent of the feed stock or of the mode of operation. A typical average hydrocarbon gas composition has been cited by Sherwood:[4]

Component	*Volume Per Cent*
CH_4	47
C_2H_6	23
C_3H_8	21
C_4H_{10}	9*
Total	100

* About 25% of the C_4 content is isobutane.

The composition of gases formed in the course of vapor phase operations is much more dependent on operating conditions than is true in the case of gaseous products of primary liquefaction. A boost in time-temperature conditions results in a corresponding increase in methane and ethane formation. Where the primary objective of vapor phase hydrogenation is the production of gasoline, conditions are carefully chosen to maintain gas formation below 2-3%. A typical byproduct gas formed in the presence of a pure tungsten sulfide ("presaturation") catalyst will analyze 36% (by volume) butane, 31% propane, and the remainder methane and ethane in a ratio of approximately 2:1. The off-gas from vapor phase splitting hydrogenation over a tungsten sulfide-on-Fuller's earth catalyst may be expected to contain 77% (by volume) butane (of which 75% is isobutane), 19% propane, and about 2% each ethane and methane.[10]

The chemical potentialities of these byproduct LP gases are considerable. After separation from methane, the ethane, propane, and butane may serve as valuable raw materials in the production of olefins and their innumerable chemical derivatives. Even the methane need not be wasted. A comparatively simple reforming operation converts it to hydrogen to be recycled.

ACKNOWLEDGMENT

The author desires to express his sincere thanks to Fred Denig, Vice-President and Manager, Production Department, Koppers Co., Inc., for his valuable suggestions and encouragement in the preparation of this article.

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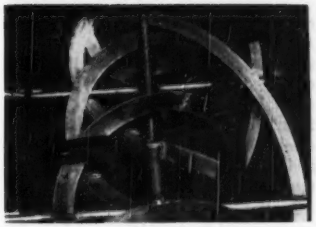
A CI REPORT ON

MIXERS FOR PASTES AND POWDERS

by JULIAN C. SMITH, Cornell University, Ithaca, N. Y.



Selection of dry mixers is still more an art than a science. The author distills knowledge, experience, and opinion to arrive at a practical guide to mixer types and a consensus on advantages and limitations of each.

IN NEARLY all processing industries, mixing of materials is one of the most important operations. Reactors are stirred to increase reaction rates and heat transfer; pastes and doughs are kneaded, masticated, and shredded while additives are incorporated; batches of dry powders are blended to insure a homogeneous, uniform product. Mixing has received a lot of study during the past few years, but most of the published articles deal with the agitation of liquids. The short list of references at the end of this report includes nearly all the articles on paste and powder mixers that have appeared in English in the last ten years.

A recent report (*CI, March 1949, p. 399*) describes the agitators used for mixing liquids. This report, a supplement to the previous one, covers equipment for the less studied but equally important branch of mixing. A clear distinction between the two parts of the field cannot be drawn, since it is not easy to say just when a viscous liquid becomes a paste. Many materials are hard to characterize; they are too thick to flow, but are far from solid. Some manufacturers call them "semi-solids." In general, this report covers the mixing of substances that are too thick to be circulated by a turbine or propeller agitator. Some of the devices covered in the previous report are included, although discs, cones, and cage beaters, which are widely used on viscous fluids, are not. Some of the blenders described here can also be used, within limits, for processing true liquids.

Except for some special devices, equipment for blending semi-solids, pastes, and powders falls into one of four classes: tank agitators for thick liquids and pastes; mixers for pastes and dry powders; kneaders, dispersers, and masticators for heavy pastes and tough, rubbery masses; and blenders for dry powders. Again the divisions are not clear-cut, for occasionally a tank agitator is used for blending powders, and once in a while someone finds a dry blender is just the thing to mix his sloppy paste. A more logical-seeming classification, proceeding from thin pastes to thick pastes to dry powders, cannot be used, for thin pastes are much like dry powders, at least as far as mixing is concerned, and are quite unlike rubbers and doughs. Pastes and powders both flow, under some conditions at any rate, and stirring them requires only moderate amounts of power. Paste mixers are often used for blending dry powders, but compounding rubbery or taffy-like masses requires special and very powerful equipment.

The various types of paste mixers, kneaders, and dry blenders are listed in Table I, and the manufacturers of them are given in Table II. Some fabricators make equipment almost exclusively for a given industry, but most of them make blenders for use in a variety of fields. A few manufacturers of agitators for viscous liquids (Types Ia and Ib), who were listed in the previous report, are not included. Ball mills, pebble mills, and some other size-reduction devices are often used for blending, but since their principal function is not mixing, no attempt was made to list all the companies which make them. Such mills are made by some of the companies listed in Table II,[1, 2, 30, 36, 43, 63, 65*] but they are also made by many other manufacturers.

MIXERS FOR THICK LIQUIDS AND PASTES

When a liquid of very high viscosity is to be stirred, the usual turbine and propeller agitators have little value. They move the liquid which is near the impeller, but the disturbance persists for only a short distance. Mixing must be done by bringing all the material to the agitator, or by having the agitator visit each part of the vessel. *Paddles, Gates, and Anchors*—For comparatively simple mixing jobs, paddle, gate, and anchor agitators are used. For paste mixing a number of paddles are mounted on the same shaft, and usually pass between sets of stationary baffles or breaker bars. The close clearances between the paddles and baffles give a localized shearing action that is effective in dissolving substances in viscous solvents; special designs with massive blades are employed in making rubber cement. Horizontal paddles, either flat or pitched, which pass between horizontal baffles, are common, as are parallel vertical paddles held by a common horizontal member and passing between stationary vertical fingers. Such agitators turn at slow speeds, usually from 20 to 60 r.p.m.; they are used in tanks up

* Numbers refer to manufacturers listed in Table II. The complete list of fabricators of a given type of mixers is given in Table I.

to 10 or 12 feet in diameter, but for true paste mixing are rarely more than 6 feet in diameter.

Gate agitators differ from multi-bladed paddles only in that they include horizontal, vertical, and sometimes diagonal members, and usually are used without stationary baffles. Paddle agitators with parallel vertical blades are sometimes called gates. Anchor or horseshoe agitators conform in shape to the bottom of the vessel; their primary function is to keep the tank wall clean. They sometimes carry vertical fingers, and often carry scraper blades that press against the wall of the vessel. Single-motion anchors are not effective mixers; they are most often used with counter-rotating paddles or screw agitators.

Most single-motion agitators operate in fairly deep tanks, with ratios of depth to diameter of 1 to 1 or 2 to 1. Modified paddle or rake agitators[39] are used in shallow steam-heated pans for mixing and drying pastes;[55] four or more sets of short vertical rakes, which scrape the flat bottom of the pan, cut through the mass and clean the heat-transfer surface. For agitating highly viscous materials double-motion agitators are usually used, but single-motion mixers work well on small batches. One design for glue mixing[11] includes three sets of horizontal and inclined paddles, and three vertical baffles; it is used in cans up to 15 gallons in size.

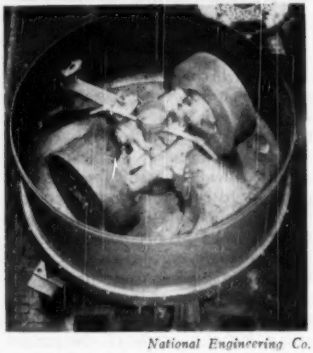
Double-Motion Agitators — Double motion agitators are effective mixers for viscous liquids and pastes. For processing small batches a sort of double motion is provided by rotating an off-center agitator in one direction and the container in the other; additional mixing may be given by stationary vertical baffles. In the usual change can or pony mixer, widely used in paint manufacture, the agitator consists of 3 or 4 vertical blades, and can easily be tilted out of the can. The container is set on a turntable driven by the same motor that turns the agitator; when a batch is finished the can is removed and replaced. Typically the can rotates at 30 to 40 r.p.m., the agitator at 60 r.p.m. The container size varies from 2 to 125 gallons. The Troy angular mixer[64] is a special change-can mixer in which the shaft enters the container at an angle. The hook-shaped agitator eliminates balling of material around the shaft, and scrapes the walls cleaner than does the conventional vertical agitator. The "Superportable" can paste mixer[38] contains two counter-rotating agitators, each with two vertical paddles, turning in a rotating container. It is made in 20-, 60-, and 100-gallon sizes. A 25-gallon change can mixer with horizontal paddles is on the market[48] in which stationary paddles are mounted on a central post; intermeshing paddles are held by lugs in the rotating can, and are removed when the batch is complete. Primarily for mixing adhesives, this mixer has been used for tea, salt, and similar dry solids. A change-can mixer for reducing thick pastes to liquid form[38] uses special propeller agitators. The paste is placed in the container,[55] and the thinner is added. The propellers are slowly lowered, mixing only the top at first, and then more and more of the vessel contents as the paste thins out.

For mixing small to fairly large batches of viscous liquids and pastes, double-motion tank agitators are widely used. One design is similar to single-motion paddles with intermeshing vertical fingers, except that both sets of fingers move through the material. Another type[55] consists of two sets of stirrer blades, each set with two stirrers. The sets revolve on their own axis and in turn revolve in a planetary manner around the container. Thus the can remains stationary and buildup of material on the sides is eliminated. Easy cleaning is provided by a hydraulic lift to raise the stirrers from the can. The leading edges of the blades are often beveled to give a cutting action, and the outermost blades usually scrape the vessel wall.

The most common double-motion agitator consists of a sweep or anchor with a counter-rotating paddle, turbine, propeller, or screw. Usually several paddles, either flat or pitched to push the material downward, are mounted on a central shaft, and the anchor carries intermeshing horizontal paddles. As in all paste mixers the speed is slow: the anchor turns at 15 or 20 r.p.m., and the paddles from 25 to 60 r.p.m. In typical glue mixers,[11, 26, 45, 57] from 10 to 250 gallons in size, the central shaft carries pitched paddles and a modified anchor that cleans the tank bottom; a counter-revolving

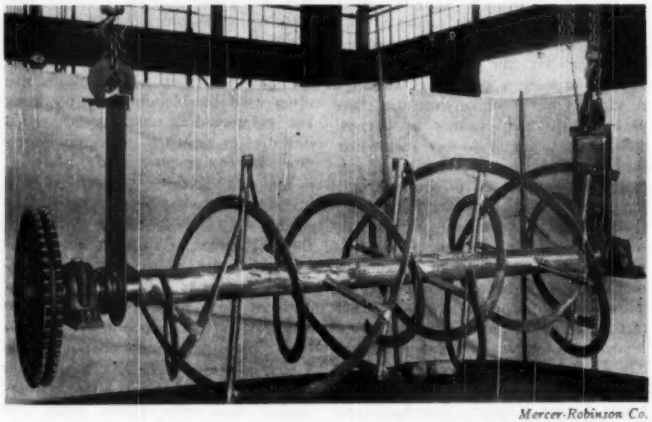
Prater Industrial Products

TWO PARALLEL VERTICAL SPIRALS, rotating at different speeds, give rapid blending in the "Blue Streak Twin Spiral" mixer.



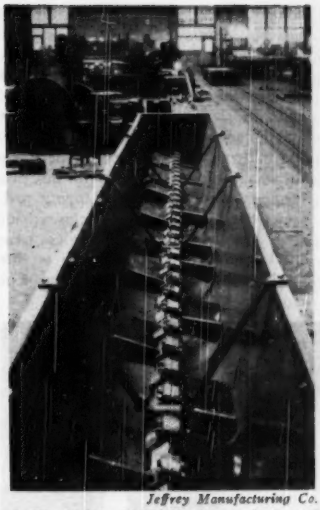
National Engineering Co.

MULLERS, widely used for putty-like paste, mix with a rubbing and smearing action that is similar to that of a mortar and pestle.



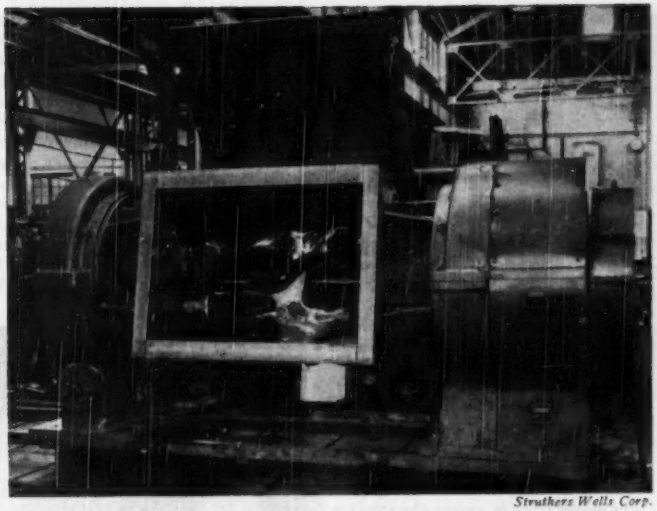
Mercer-Robinson Co.

THE RIBBON BLENDER, in which spiral ribbons turn in a trough or cylinder, is a very common type. Concentric spiral ribbons are usually used for batch mixing operations.



Jeffrey Manufacturing Co.

CAST IRON PADDLES in a horizontal trough provide mixing in the Sugar Mingler.



Struthers Wells Corp.

SIGMA-SHAPED BLADES 180° apart which, during rotation, alternate in pushing the mix down in the center of the trough are the most common for blending moderately heavy pastes.

sweep which has no intermeshing blades cleans the sides of the vessel. In the Hy-R-Speed mixer,[34] designed for paint, a sweep turns counter to an eccentric agitator consisting of two vertical blades, twisted to give some cutting action and radial motion. The standard size is 100 gallons.

The clearance between a sweep agitator and the vessel wall, for many mixing problems is ½ to 5/8 of an inch. When the paste clings tightly to the wall, scraper blades are attached to the sweep; the mechanical cleaning improves the heat transfer and avoids decomposition of heat-sensitive materials. The wear on the walls, of course, is appreciable, and for continuous heavy duty only vessels of cast metal are suitable. Since the casting must be machined to give a truly circular interior, such vessels are expensive; a jacketed kettle with double-motion scraper agitators may easily cost five times as much as a similar tank for agitating a thin liquid. With some materials paddles do not give the proper degree of circulation, and a turbine or a propeller in a draft tube is more effective. The Agi-Mixer[22] is a special high-speed turbine (the Homo-Mixer) used in conjunction with a sweep carrying scrapers. Soap crutchers contain a scraper agitator and a central helix which forces the soap down through a vertical draft tube. The helix works well on thick masses, but is useless for liquids and thin pastes.

The power required to mix pastes is much greater than that needed for agitating liquids. In stirring a thin liquid, 5 HP per thousand gallons gives violent agitation; in mixing pastes, depending on the viscosity and density, five to fifty times as much power is delivered to the mass. In the Hamilton "Mix-Cooker,"[31] a double-motion open kettle for fairly light duty, the power used is 1 to 2 HP per *hundred* gallons; in change-can mixers and other vessels for heavy pastes, from 5 to 15 HP per hundred gallons is used.

MIXERS FOR PASTES AND DRY POWDERS

As mentioned before, several types of blending equipment are utilized for mixing thick liquids, moderately heavy pastes, and dry powders. Some, such as bowl mixers with off-center beater agitators, are used most on pastes, and to only a limited extent on powders; others, ribbon and paddle blenders and tumbling mills, are used about equally for both services; still others, such as mullers and pan mixers, are used most widely on dry materials, but are also valuable for mixing pastes.

Beater Agitators—A good way to mix fairly small batches of dry materials, creams, and light plastic masses is with a vertical beater agitator with planetary action. The agitator may be a cage, as in household egg beaters, or flat with several parallel arms. Sometimes a single C-shaped arm is most effective. The beater visits each part of the mix in turn, and insures that all the charge is thoroughly stirred. Interchangeable open bowls and agitators are available;[5, 53, 55] the bowl capacity ranges from 1 to 85 gallons. In some designs the container tilts for discharging.[39] For quantities larger than 35 gallons a fixed jacketed tank may be used. Variable-speed or multi-speed drives are usual accessories; in some bowl mixers[5, 6, 7] the ratio of the beater speed to the speed of the head can be changed at will. This ratio affects the amount of swirling and the mixing effectiveness: a ratio of 5 beater revolutions to one revolution of the head gives maximum swirling; a ratio of 2 to 1 gives minimum swirling and the largest amount of beater action on the material in the bowl. Moderate amounts of power are needed; the motor on an 85-gallon bowl mixer is 7½ HP, with a 2 HP takeoff to drive the precession shaft.

Ribbon and Paddle Mixers—One of the oldest and most common types of mixers for pastes and powders is the ribbon blender, in which one or more spiral ribbons turn in a trough or cylinder. Sometimes the container is short,[38, 39, 53, 55, 69] but most often it is 5 to 10 times as long as it is wide. For light duty a single central shaft, carrying any one of a number of designs of ribbons, is used. In continuous mixers a single spiral moves the material from one end of the trough to the other; in batch mixing opposing

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spirals move the material back and forth.

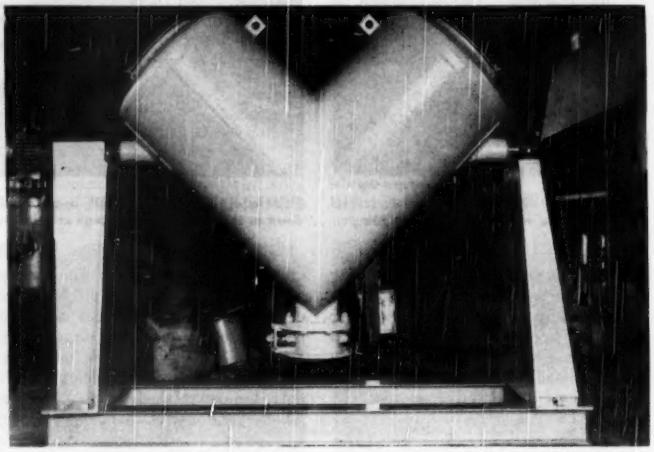
The standard batch agitator has two concentric spiral ribbons. The inner one works the mix fairly slowly toward the inlet, and the outer one moves it rapidly toward the discharge. In batch mixing the discharge is usually at the center of the trough, through slide gate or flush bottom plug valves, or through a hinged gasketed door. Tilting mixers are also available.[19, 38, 55] With center discharge, opposing halves of a double agitator give very intense mixing at the center of the trough; with end discharge the material enters at one end of the trough, is shuffled back and forth, and discharges from the other end.

Single-shaft ribbon mixers are excellent for dry powers and light pastes, and work well on fairly heavy pastes provided the material does not form a cylinder around the entire agitator. For mixing heavy pastes the spiral is cut out at intervals to make it easier to move through the mass. For some powders ribbons and mixing paddles are used in combination, with the paddles on the ribbon or on separate radial arms. One mixer for feed and grain[18] contains a ribbon sweep, counteracting paddles, and adjustable wings on the ribbon that move the material toward the shaft. For semi-liquids scraping trowels are used with the ribbon,[43, 55, 68] as are T-shaped scrapers.[19] The Day "Cut-it-in" agitator[19] for cutting fats and oils into powders consists of a ribbon and numerous longitudinal and radial rods.

Ribbon mixers are available in wood, steel, and nearly all common metals and alloys. Special designs include sprays for incorporating liquids into solids, dust-tight casings, and wipers or brushes on the spiral to clean the walls of the trough. The feed may pass through on attached brush sifter before entering the mixer. Units for operation under vacuum or considerable pressure are available.[19, 43, 53] A special unit for mixing and heating ammonium nitrate has very smooth interior surfaces.[43, 53] In several models the entire agitator can readily be lifted from the trough. In continuous ribbon mixers an adjustable bulkhead near the discharge port controls the amount of mixing and the rate of discharge; for satisfactory operation such blenders must be provided with accurate control of the feed rates. Single-shaft batch ribbon blenders range up to 1200 cubic feet in capacity,[47] and take from 5 to perhaps 30 minutes to mix a batch. The power required is about 10 HP per hundred cubic feet for light duty, and 20 to 30 HP per hundred cubic feet for mixing pastes.

Combined Action Mixer—A single ribbon does not work on very sticky material, but two parallel ribbons in a double trough may be quite effective. Double-shaft mixers with plain ribbons, however, are useful on only relatively few materials; most designs are modifications of the heavy-duty two-arm kneaders described later. The Twin-Screw mixer[44] is a special two-shaft blender with parallel screws in which most of the mixing is done by a bladed beater at one end of the trough. One conveyor brings the material to the beater; the other takes it away, and transfers it to the first conveyor. The screws turn at about 55 r.p.m., the beaters about three times as fast. Ten to twenty HP per hundred ft.^{3} are usually required for rapid mixing. The Kutmixer[44] is similar except that high-speed (1200-1800 r.p.m.) knives are used in place of beaters; it is excellent where shearing and mixing must be combined, as in sausage making. Slide valves permit shutting off the knives, leaving the screws to continue the mixing after the cutting is complete.

For mixing many heavy pastes and dry powders the ribbons are replaced by paddles or trowels. Single-shaft paddle mixers, continuous or batch, are useful for crystalline and abrasive powders that are hard to mix. The pitch of the paddles may be adjustable, and the blades are often renewable and have hardened outer edges. Frequently, as in the Day Dry-Color mixer,[19] several concentric, counter-acting sets of paddles are used. Binding agents are mixed with powders for tabletting operations in small single-shaft paddle mixers.[60, 69] The Blystone[59] and Ransome[69] mixers, primarily for core sand mixing, contain a heavy hexagonal shaft and very rugged shovel agitators. Two-shaft paddle mixers handle thick pastes; the pug-mill, described later, contains sharp-edged paddles that mix and convey very heavy clays. The two-shaft Broughton mixer[20] is designed for mixing hair and other fibrous materials with plaster. Overlapping paddles, often perforated, are required for some products; for soap powders two-shaft mixers of this kind are on the market,[32, 55] and for heavy viscous masses the triple-shaft B and B mixer[32] and the Triplex mixer[44] are very effective. The mixing action in overlapping paddle mixers approximates that in the kneaders and masticators described in the next section.



Patterson-Kelley Co., Inc.

THE P-K TWIN SHELL DRY BLENDER, consisting of two cylinders joined in a V, operates much like a double-cone blender. Since the mix is never far from the axis less power is used.

Paddle mixers operate at slow speeds, typically 15 to 40 r.p.m., and require, in general, more power than ribbon mixers. For moderate duty 30 to 50 HP per hundred cubic feet is supplied; for mixing things like plaster and sand 75 HP per hundred cubic feet is required. As with ribbon mixers, heating or cooling jackets may be used, and operation under pressure or vacuum is fairly common. When provided with a jacket and suitable inlets and outlets, paddle mixers are very useful for continuous drying of granular solids and for batch or continuous gas-solid reactions.

Tumbling Drums—For dense materials, say 100 lb. per cubic foot, and for free-flowing powders, tumbling drums of various designs are very satisfactory. A simple way to mix small quantities of liquids, pastes, or powders in their own shipping containers is to use

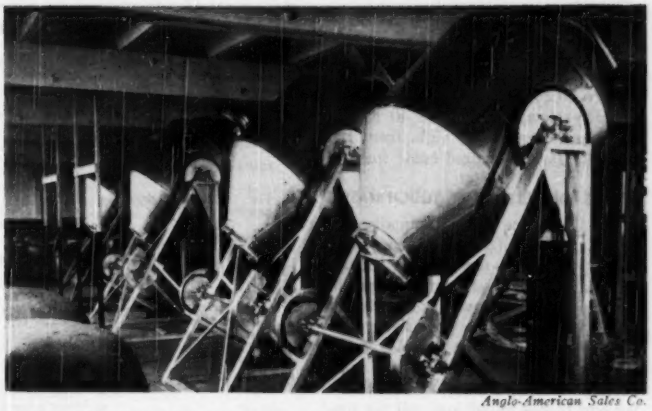
a pail tumbler,[1, 2, 65] a drum roller[1, 2, 65] or a drum tumbler.[65] Larger quantities are mixed in a cylinder rotating about a horizontal axis; the cylinder itself may be vertical, horizontal, or inclined. The Tumbelmixer[65] is a 25-gallon stoneware tumbler, usually with a smooth glazed interior surface. Internal baffles may be supplied. Cement mixers contain lifting flights, and tilting machines of this kind are used to some extent for blending chemicals.[29, 55, 69] Ransome mixers[69] are large horizontal tumblers containing flights that throw the mix back and forth; they are widely used on dyes, soap powder, fertilizers, core sand, and similar products. Liquids may be added while the drum rotates. Capacities range from 13 to 260 cubic feet; the power required is about 30 HP per hundred cubic feet.

The "Rocker Roll" Drum Mixer[65] combines the mixing features of a drum roller and a drum tumbler. As the drum revolves (about 13 times per minute) it rocks back and forth on its axis (about 8 times per minute). Such units are available to handle 1 to 4 and 30 to 55 gallon drums.

To combine grinding and mixing in one operation, pebbles, balls, or rods may be added to the revolving drum. Several of the companies listed in Table II make pebble mills[1, 2, 55, 65] and many make ball mills;[1, 2, 30, 36, 37, 43, 63, 65] since mixing is not the principal function of the devices, however, no attempt has been made to compile an exhaustive list of manufacturers.

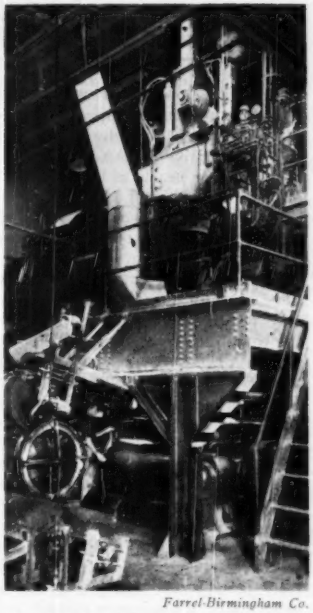
Mullers and Pan Mixers—A mixing action distinctly different from that in other blenders is a characteristic of muller mixers, also known as putty chasers and edge runners. One or two heavy vertical mulling wheels, of stone or chilled steel, rotate in a horizontal pan; since the wheels are wide, material caught between them and the floor of the pan is rubbed or smeared as with a mortar and pestle. Scraper blades turn the material over and do some mixing; they also clean the floor and sometimes the walls of the pan, and direct the mix into the path of the mullers. Muller mixers give more stable blends than do ribbon or paddle mixers, especially where particles are to be uniformly coated as in conditioning foundry sand with water. They are also widely used for putty-like pastes.

The Simpson Mix-Muller[45] consists of a stationary pan or crib, and one or two rotating mullers. One plow directs material from the crib wall to one muller; another cleans the center of the crib, and pushes material outward. The charge enters from above, is mixed for from 3 to 20 minutes, and discharges through ports in the floor. Special designs are available for heating the mix, for operation under vacuum, and for timing the batch cycle automatically. Capacities range from 0.2 to 50 ft.^{3}/batch.



Anglo-American Sales Co.

DOUBLE CONE BLENDERS are charged through the small end of one cone. Mixing time is 5-20 minutes in an unbaffled mixer; 1-2 minutes in the internally baffled MacLellan unit.

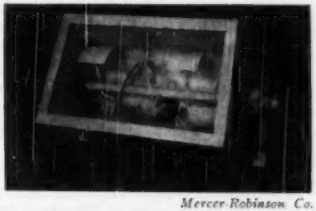


Farrel-Birmingham Co.

BANBURY MIXERS use so much power that overheating is prevented with cooling water.

Worthington Pump and Machinery Corp.

PAN-TYPE BLENDERS turn to an inclined axis. The Ransome unit has four metallic blades.



Mercer-Robinson Co.

TROWEL-TYPE MIXERS blend fats with flour, as in the production of premixed flours.

In the Clearfield muller[16] the pan rotates and the muller axis is stationary. In place of plows a star-shaped agitator, driven by the stream of solids creates an eddy in the stream and prevents buildup around the hub and on the revolving bottom. An adjustable inclined disc scrapes the walls during the mixing, and lifts the material out of the crib and aerates it while discharging. In the Lancaster mixer[50] the muller axis is off-center, and the pan and the mullers are both driven in opposite directions. The discharge port is at the center of the pan. Normally two mullers and one driven plow, or one muller and two plows, are used; stationary plows give additional mixing and clean the crib wall. When mulling is not required, all the mullers are replaced with plows. The unit is then called a pan mixer, and is an effective powder blender.

Muller mixers have a wide range of application, since they can handle semi-solids, pastes, and dry powders rang-

ing in particle size from one micron to 1½ inches or more. They are designed to give effective mixing with a minimum grinding. Sizes range from 1/20[50] to 50 cubic feet.[45, 55] The rotation is fairly slow, from 13 to 40 r.p.m.; the power required is high, from 100 to 200 HP per hundred cubic foot.

MIXERS FOR VERY HEAVY, TOUGH MASSES

For blending and compounding heavy, non-flowing pastes and tough, rubbery masses—the hardest of all materials to mix—standard equipment is the two-arm heavy-duty kneader or masticator. Operating in a short wide trough with a saddle in the floor, overlapping or tangential arms of a wide variety of designs are available. Overlapping blades knead and pull the material; tangential blades are used for mastication and for dispersion of powders into heavy masses. The units are rugged, slow moving, and exceedingly powerful. For somewhat specialized services screw extruders, pugmills, and roll mills are also employed for blending heavy, tough materials.

Two-arm Kneaders and Masticators—For kneading and blending moderately heavy pastes the most common blades are sigma-shaped. The arms rotate toward each other, drawing material downward in the center of the trough. The relative position of the two arms affects the amount and kind of mixing and the power required. Arms 180 degrees apart, which alternate in pushing the mix down, give the minimum amount of mastication, and the mixing time is long. The power required is also a minimum. If the blades are set to come together just above the saddle there is considerable mastication between the arms and the ends of the trough, and very much more power is needed. The double naben or fish tail agitator has overlapping blades which form a split spiral ribbon; it is used for heavy plastic materials.

Tangential spiral agitators are common for dispersing such things as dry colors in plastic masses. Standard designs are 135-degree and 180-degree spirals, set so that at any one point in the trough the blades are 180 degrees apart. Bar dispersers are sometimes used.[19] The Banbury mixer[25] contains dispersing blades that form an interrupted spiral; it is widely used for compounding rubber and for other purposes. For shredding operations the edges of sigma-blade agitators are serrated, as is the point of the saddle;[19] serrated duplex spiral agitators are also available.[9] Special units for acetylating cellulose are widely used,[53] although to some extent they are being replaced by centrifugal blenders. Mastication requires the most power of all. It is done by very heavy tangential blades which operate in unison, with one shaft rotating at twice the speed of the other. Masticators are often called "intensive mixers." The drive shafts may be nearly as large in diameter as the agitators, and are sometimes driven from both ends. Spiral, flat, elliptical, and other designs of masticator blades can be obtained.

Kneaders are charged from above, often through an attached chute, and may be discharged through ports in the trough. In some designs the entire bottom of the trough moves downward,[41] and the centrifugal action of the blades makes discharging rapid and complete. With most materials, however, the trough is tilted or inverted for discharging. During operation pressure may be applied to the mass by a pneumatically-operated ram in the feed chute; vacuum kneaders are also on the market. The time required to mix a batch varies considerably, from perhaps ten minutes to one or more hours; a continuous cascade unit with several kneaders in series is supplied by Baker Perkins[9] for relatively light service.

The power required to drive kneading equipment is, of course, very great, and as more power per unit must be supplied the maximum batch size decreases. Standard-duty kneaders range in size from ¼ gallon to 3600 gallons,[55, 62] and require 6 to perhaps 30 HP per hundred gallons; dispersers are smaller, and draw up to 100 HP per hundred gallons; masticators are smaller still, and require even more power. A 170-gallon North-Erie special duty masticator[47] is supplied with a 1200-HP motor; Banbury mixers[25] handle up to 160 gallons of material, and draw up to 1500 HP. The problem of heat removal also limits the batch size, for such enormous amounts of power rapidly heat the mass, and to avoid burning elaborate provision for cooling must be made. Nearly all kneaders are jacketed, and often the agitator shafts are cored for additional cooling. A large Banbury requires 200 g.p.m. of cooling water.

Mixer Extruders and Pugmills—Continuous mixing, working, and heating of thermoplastics is done in cylindrical extruders containing a heavy-duty helix. Single-screw units[25] 6 to 20 inches in diameter handle from 250 to 800 lb. per hour. Another design[67] uses two parallel worms for mixing and a single worm for extruding; standard units handle from 110 to 1300 lb. per hour and draw from 5 to 125 HP.

Pugmills are heavy-duty continuous conveyor mixers widely used for blending liquids with heavy solids. Conveying paddles, usually sharp-edged, are set on one or two shafts in a heavy casing; they cut through the mass, mix it, and often extrude it through ports in one head of the trough. Considerable pressure is built up in the casing, and the "pugging" action of the blades is essential for making such things as heavy clay and structural tile. Pugmills are also used for mixing fluorspar with sulfuric acid in HF manufacture. In some designs a single shaft rotates at say 125 r.p.m. in one direction, and a cylindrical casing at 5 r.p.m. in the other. Typical units handle from 5 to 55 tons per hour, and require 10 to 100 HP.

Roll Mills—Heavy-duty roll mills with open rolls are used for a rather lim-

TABLE I * TYPES OF BLENDERS

No.	Service	Type	Made By*
I	For viscous liquids and pastes	a. Tank, paddle or gate agitator	3a, 7, 11, 13, 14, 23, 35, 36, 38, 39, 43, 46, 53, 55, 64, 65
		b. Tank, anchor agitator	3a, 7, 14, 35, 36, 39, 43, 53, 65
		c. Rotating change can, paddle agitators	3a, 13, 19, 23, 38, 48, 55, 64
		d. Tank, double-motion paddles	14, 23, 35, 36, 39, 43, 46, 55
		e. Tank, double-motion paddle plus sweep	11, 14, 26, 31, 32, 34, 35, 36, 39, 43, 46, 65
		f. Tank, double-motion propeller or screw plus sweep	14, 35, 39, 65
II	For pastes and dry powders	a. Tank, beater, agitator with planetary motion	5, 15, 21, 35, 39, 53, 55
		b. Horizontal ribbon blender	1, 2, 3, 3a, 7, 18, 19, 21, 23, 24, 28, 33, 35, 36, 38, 39, 40, 43, 44, 47, 53, 54, 55, 58, 62, 67, 68, 69
		c. Horizontal paddle or trowel blender	2, 13, 19, 20, 21, 28, 35, 37, 39, 40, 43, 44, 47, 53, 55, 58, 59, 60, 69
		d. Tumbling mill	1, 2, 13, 30, 36, 37, 43, 47, 55, 61, 63, 65, 69
		e. Muller or pan mixer	13, 16, 36, 45, 50, 55
III	For very heavy pastes, rubbery masses	a. Kneader and masticator	2, 9, 13, 19, 25, 28, 35, 38, 41, 47, 53, 55, 62
		b. Mixer extruder	13, 25, 35, 36, 47, 62
		c. Pug mill	13, 35, 36, 40, 47, 50, 58
		d. Mixing rolls	13, 19, 25, 55, 64, 66
IV	For dry powders	a. Tumbling double cone	1, 2, 6, 12, 17, 27, 35, 36, 47, 65
		b. Tumbling cylinder or prism	8, 10, 43, 47, 49, 53, 55, 63, 69
		c. Vertical screw	13, 24, 35, 40, 51, 53, 58
		d. Centrifugal mill	13, 57, 58
		e. Vibrating conveyor	37
		f. Rotating tilting pan	69
V	Special	Special	
		For pastes:	1, 5, 22
		For pastes and powders:	40, 44, 52, 53, 54, 61
		For all services:	35, 42, 47
		Custom fabrication:	4, 15, 39

* Numbers refer to manufacturers listed in Table II.

TABLE II—MANUFACTURERS OF BLENDING EQUIPMENT

Number	Company	Address	Trade Names of Mixers	Principal Use of Mixers
1	Abbe Engineering Co.	New York 7, N. Y.	Abbe-Lenart; Diapersall; Provo	
2	Paul O. Abbe Inc.	145 Center Ave., Little Falls, N. J.		
3	Acme Coppersmithing & Machine Co.	Oreland, Pa.		
3a	Allied Steel and Equipment Co.	Chester, N. J.		
4	Alloy Fabricators Div. of Continental Copper & Steel Industries, Inc.	Perth Amboy, N. J.		
5	American Machine and Foundry Co.	485 Fifth Ave., New York 17, N. Y.	Oakes	Foam rubber, mayonnaise, cake batters
6	Anglo-American Mill Sales Co., Inc.	Owensboro, Ky.	MacLellan	
7	Artisan Metal Products, Inc.	73 Pond St., Waltham 54, Mass.		
8	Aurelio Tanzi Corp.	430 Jefferson St., Brooklyn 6, N. Y.	ACMA	
9	Baker Perkins, Inc.	Saginaw, Mich.		
10	Barber Tumbling Machine Works	P. O. Box 283, Oak Park, Ill.		Adhesives
11	Black Bros. Co., Inc.	Mendota, Ill.		
12	Blaw-Knox Div., Blaw-Knox Co.	P. O. Box 1198, Pittsburgh 30, Pa.		
13	Bonnot Co.	Canton, Ohio		
14	Buffovak Equipment Div., Blaw-Knox Co.	Buffalo 11, N. Y.	Dopp	
15	P. F. Campbell	55 Laurel St., Philadelphia, Pa.		
16	Clearfield Machine Co.	Clearfield, Pa.		Foundry sand
17	A. Daigger and Co.	159 W. Kinzie St., Chicago 10, Ill.	MacLellan	
18	H. C. Davis Mill Machinery Co.	Bonner Springs, Kansas		Feed and grain
19	J. H. Day Co., Inc.	Cincinnati 22, Ohio	Various	
20	Dunning and Boschert Press Co., Inc.	329 W. Water St., Syracuse 4, N. Y.	Broughton	Plaster, stucco, soap powder
21	Edge Moor Iron Works, Inc.	Edge Moor, Del.		
22	Eppenbach, Inc.	45-10 Vernon Blvd., Long Island City 2, N. Y.	Agi-Mixer; Homo-Mixer	
23	Epworth Mfg. Co.	6587 Epworth Blvd., Detroit, Mich.		
24	Fairfield Engineering Co.	Marion, Ohio	Haines	Feed and grain
25	Farrell-Birmingham Co., Inc.	Ansonia, Conn.	Banbury; Mixer-Extruder	Rubber, plastics, linoleum
26	Chas. E. Francis Co.	Huntington, Ind.		Adhesives
27	General Machine Co. of N. J.	398 Market St., Newark 5, N. J.	GEMCO: Muench	
28	General Mixing Equipment Co.	413 No. Third St., Philadelphia, Pa.		
29	Gilson Bros. Co.	Fredonia, Wis.		Cement
30	Gruendler Crusher and Pulverizer Co.	2915-2917 No. Market St., St. Louis 6, Mo.		
31	Hamilton Copper and Brass Works, Inc.	Dixie Highway and Lincoln Ave., Hamilton, O.	Mix Cooker	
32	Houchin Machinery Co., Inc.	Sixth and Van Winkle Aves., Hawthorne, N. J.	B and B	Soap powder
33	Hughesville Machine and Tool Co.	54 W. Academy St., Hughesville, Pa.		
34	Hy-R-Speed, Inc.	1127 Riverside Dr., Los Angeles, Calif.		Paint
35	Industrial Process Engineers	8 Lister Ave., Newark 5, N. J.		
36	International Engineering, Inc.	Dayton, Ohio		
37	Jeffrey Mfg. Co.	Columbus 16, Ohio		
38	Kent Machine Works, Inc.	37-41 Gold St., Brooklyn 1, N. Y.		Paint, ink, chemicals
39	L. O. Koven and Brother, Inc.	Jersey City, N. J.		
40	Link-Belt Co.	2410 W. 18 St., Chicago 8, Ill.		
41	Evarts G. Loomis Co.	126 S. 14 St., Newark 7, N. J.		
42	Marco Co., Inc.	Wilmington 50, Del.	Kom-bin-ator; Homogenizer	Chemicals, foam rubber, greases
43	Mercer Robinson Co., Inc.	30 Church St., New York 7, N. Y.	Unique	
44	Mixers, Inc.	3325-47 E. Allen St., Philadelphia 34, Pa.	Twin Screw; Triplex; Kutmixer	
45	National Engineering Co.	549 W. Washington Blvd., Chicago 6, Ill.	Simpson Mix-Muller	Foundry sand
46	New England Tank and Tower Co.	Everett, Mass.		
47	H. W. North Co.	1213 Parade St., Erie, Pa.	North-Erie; Superkneader	
48	Samuel R. Parry Machine Co., Inc.	224 Mill St., Rochester, N. Y.		Adhesives
49	Patterson-Kelly Co., Inc.	East Stroudsburg, Pa.	P-K Twin Shell Dry Blender	
50	Posey Iron Works, Inc.	Lancaster, Pa.	Lancaster, Mixer	
51	Prater Industrial Products	1515 S. 55 Court, Chicago 50, Ill.	Blue Streak Twin Spiral	
52	Pulverizing Machinery Co.	Chatham Rd., Summit, N. J.	Mikro-Pulverizer, Mikro-Atomizer	Cosmetics, cold water paints, dry colors
53	Read Machinery Div. of Standard Stoker Co., Inc.	York, Pennsylvania		
54	Rietz Mfg. Co.	441 Folsom St., San Francisco 5, Calif.	Rietz Disintegrator	
55	Charles Ross and Son Co.	148-156 Classon Ave., Brooklyn 5, N. Y.		Superphosphates, fertilizers
56	A. J. Sackett & Sons Co.	1701 S. Highland Ave., Baltimore 24, Md.		
57	Safety Car Heating and Lighting Co., Inc.	P. O. Box 904, New Haven 4, Conn.	Entoleter	
58	Sprout Waldron and Co., Inc.	Muncy, Pa.		
59	Standard Sand and Machine Co.	549 W. Washington Blvd., Chicago 6, Ill.	Blystone	Core sand
60	F. J. Stokes Machine Co.	Philadelphia 20, Pa.		With tabletting machines
61	Storms-Harvey Equipment Co.	123 Bleecker St., New York, N. Y.		
62	Struthers Wells Corp., Titusville Div.	Titusville, Pa.	Northmaster	
63	Sturtevant Mill Co.	Park and Clayton Sts., Dorchester, Boston 22, Mass.	Dry-Batch mixer	
64	Troy Engine and Machine Co.	Troy, Pa.		
65	U. S. Stoneware	Akron 9, Ohio	Tumbelmixer	Molding powders, adhesives, paints, pigments
66	Vaughn Machinery Co.	Cuyahoga Falls, Ohio		Rubber
67	Welding Engineers, Inc.	Norristown, Pa.	Compounder-Extruder	
68	Wolf Company	Chambersburg, Pa.		
69	Worthington Pulp and Machinery Corp., Ransome Div.	Dunellen, N. J.	Ransome	Glass batches, fertilizer, chemicals, foods and drug

ited number of mixing operations. As with ball mills, the principal function is size reduction, not mixing, and the list of manufacturers is not complete. Roll mills are useful, however, for certain difficult mixing problems.

The rolls may rotate at the same speed, but usually they turn at different speeds, with differentials as high as 3 to 1. Three-roll mills[19, 55, 64] give exceedingly stable, uniform blends of pigment and vehicle in making printing inks; two-roll mills[25, 55, 66] find application in compounding rubber and some plastics. One roll is allowed to coat itself with plastic or rubber; the layer is cut with a heavy knife or machete, and is folded over to the top of the rolls. Solids may be added during the operation. The material becomes quite hot, even though the rolls are cooled; sometimes the rolls are deliberately heated for high-temperature milling. Standard rolls for rubber compounding range from 40 to 84 inches in length, and are 16 to 28 inches in diameter.

Roll mills require constant attention and skilled operators, and have relatively low throughput capacities. In rubber processing they have been largely superseded by two-arm mixers of the Banbury type, since a single large Banbury can turn out as much as 8 or 12 84-inch roll mills can produce.

MIXERS FOR DRY POWDERS

As mentioned before, in many respects dry powders are like flowable pastes, and many types of blenders can be used for mixing either one. Some types, however, are used exclusively, or nearly so, for blending powders. Certain kinds of tumblers, vertical screw blenders, centrifugal mills, and vibrating conveyors fall in this category. Solids are often blended without mechanical agitation, for granular materials can be mixed to some extent by allowing two streams to meet in

a vertical or inclined pipe, or by flowing a very rough blend over a vertical cone, down the sides of which the material runs. The mixing in a bed of fluidized solids, also, is very thorough. This discussion, however, is limited to blenders that mix by mechanical action.

Double-Cone Blenders—A very common type of blender consists of two cones joined at the base by a short cylindrical section; the shell revolves about a horizontal axis that passes diametrically through the cylinder. The charge is admitted from above through a valve in the small end of one cone; after 5 to 20 minutes of tumbling, it is discharged by gravity from the other end of the shell. For free-flowing materials the cone angle is 45 degrees; cones with a 60-degree angle are used when the angle of repose of the powder is large. Most units contain no internal baffles or flights. With many products, however, the baffles in the MacLellan mixer[6, 17] are a definite help, for they give 12 mixings and separations per revolution. At 5 r.p.m., therefore, one or two minutes of mixing is usually enough. The Muench double-cone blender[27] contains a vertical disc that rotates with the shell, and a high-speed grooved disc at a short distance from it; the rubbing action of the discs improves the blending of many fine powders, and, when teeth are added to the high-speed disc, effectively breaks up lumps. Plain double-cone blenders operate best when about 60% full, MacLellan mixers about 50% full. Standard units are available with working capacities of from 5 quarts to 600 cubic feet,[47] and require from 5 to 30 HP per hundred cubic feet. MacLellan mixers range up to 160 cubic feet in size.

Tumbling Cylinders and Prisms—Tumbling drums and mills are used for mixing both pastes and powders, and some models have already been described. Other designs, however, are used only for dry solids. The Ransome[69] and Sturtevant Dry-Batch mixers[63] have a horizontal drum rotating at from 8 to 17 r.p.m., internal flights carry the material from the ends to the center of the drum. The special design insures dustless operation. A revolving drum or can type machine,[55] used principally by the plastics industry, features a removable can or drum to facilitate changing from one color to another. It has a direct motor drive. Special drum blenders for very heavy powders are also available,[10, 69] which are loaded at one end from a chute, and are discharged from the other. Sturtevant blenders handle from 12 to 550 cubic feet of material per batch, and draw about 15 HP per hundred cubic feet. Mixing times range from 2 to 30 minutes per batch.

The P-K Twin-Shell Dry Blender[49] is a new device consisting of two cylinders joined to form a V, rotated about a horizontal axis. It operates much like a double-cone blender, but uses less power since the mix is never far from the axis of rotation. It is made in sizes from 10 to 300 cubic feet.

Loose flaky materials can be effectively mixed in unbaffled tumbling pyramidal drums which turn about a horizontal axis. One design[43] has hexagonal ends and rectangular sides; another[53] has triangular sides, and the ends are pentagons. They range in size from 5 to 75 cubic feet. In the ACMA mixer,[8] a cubical drum rotates about one corner; two side-entering Z-shaped agitators make the device very effective for blending small amounts of one powder with larger quantities of other ingredients. One drum tumbler[65] for standard 55-gal. drums has a conical blender attachment.

The Ransome[69] "mushroom-bowl" or pan-type blender[69] is widely used for candy, drugs, and plastics. A circular pan turns about an inclined axis, and contains 4 blades to enhance the mixing action. The speed of rotation and the angle of inclination are adjustable. The pans are from 28 to 84 inches in diameter, and hold up to 3000 lb.; from 1½ to 2½ HP is required. The Ross pan-type blender[47] contains 4 or 6 metal balls as mixing aids.

Vertical Screw Blenders—Vertical screw mixers are almost standard for mixing feeds, and are coming into use for other granular materials with bulk densities less than 50 lb. per cubic foot. They consist of a cone-bottomed tank with a fairly long lower leg; a vertical screw conveyor operates in the leg and extends up into the tank where it is surrounded by a cylinder much like a draft tube in liquid mixers. Grain enters at the bottom of the leg, and is lifted by the screw. It spills out of the top of the tube into the tank, and circulates to the bottom of the tube, where it is mixed with other material. A discharge port is set in the cone. Standard units handle one or two tons of light material per batch. The Haines mixer[24] has an enlarged screw in the leg, and a flared entrance to the mixing tube. The "Blue Streak Twin Spiral" mixer[51] has two parallel spirals, rotating at different speeds, which give very rapid mixing.

Centrifugal Blenders—Continuous centrifugal mill blenders are a recent development for mixing light powders. Originally designed for insecticide manufacture, they are finding increasing use in other fields. In the Sprout-Waldron mixer[58] powders are premixed in a ribbon blender and are fed between vertical plates rotating at a high speed. Intermeshing fingers on the plates mix by impact and by centrifugal action, and are designed to give a minimum amount of grinding. The temperature rise through the mill is 9° F or less. Capacities range from 1 to 11 tons per hour.

The Entoleter[57] also handles powders with bulk densities around 25 lb. per cubic foot. In this device two or more streams of powder are fed to the top of two horizontal rotating discs. Vanes between the discs throw the material outward and thoroughly blend the ingredients of the feed. The peripheral speed is 13,000 ft. per minute. The standard unit is 2 feet in diameter and 3 feet high; it handles up to 6 tons an hour. Sometimes for difficult problems two units are used in series.

Vibrating Conveyors—The Jeffrey vibrating conveyor mixer[37] carries material down an inclined trough, and at short intervals drops it from one horizontal step to another. Notches in the treads of the steps increase the mixing action. Standard sections are 10 feet 10 inches long, but a number of sections may be used in series. Widths vary from 10 to 57 inches, and capacities up to 40 or 50 tons an hour. These mixers are useful for blending granular products and simultaneously treating them with infrared or ultraviolet light, or for operations such as toasting dry cereals.

SPECIAL MIXERS

In addition to the many standard blenders on the market, there are a number of mixing devices that almost defy classification. Some of them, like the Agi-Mixer,[22] the Twin Screw Mixer,[44] and the Kutmixer,[44] have already been described, and other unusual modifications of the common designs have been mentioned. Some special units are designed for pastes, others for pastes and dry powders, still others for all classes of mixing, including the compounding of tough, rubbery masses.

The Abbe-Lenart Dispersall[1] contains a horizontal disc with curved radial ribs, which rotates at the bottom of a tank. Material is forced through a stator ring at the bottom of a stationary cylinder carrying vertical slots. The paste passes upward between the tank wall and the cylinder, flows inward through the slots, and returns to the mixing disc. This machine has been very successful on materials such as toothpaste. Sizes range from 0.5 to 330 gallons; from 0.25 to 25 HP is required.

(*Turn to page 921*)

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$$POCl_3 + 3\text{-}COH \longrightarrow 3\text{-}CCl + H_3PO_4$$
$$POCl_3 + 3ROH \longrightarrow (RO)_3PO + 3HCl$$
$$PSCl_3 + 3ROH \longrightarrow (RO)_3PS + 3HCl$$
$$PCl_3 + 3ROH \longrightarrow (RO)_2POH + RCl$$
$$C_6H_5PCl_2 + 2ROH \longrightarrow C_6H_5P(OR)_2 + 2HCl$$
$$C_6H_5POCl_2 + 2ROH \longrightarrow C_6H_5PO(OR)_2 + 2HCl$$
$$C_6H_5PSCl_2 + 2ROH \longrightarrow C_6H_5PS(OR)_2 + 2HCl$$

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THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

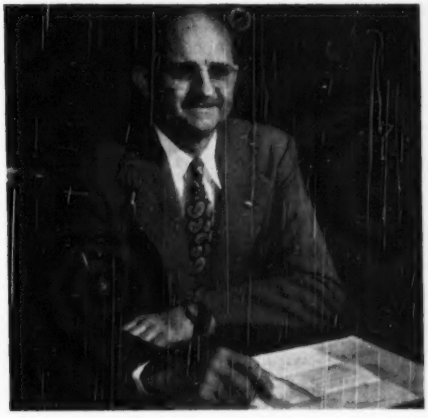
PEOPLE

JERVIS J. BABB, elected president of Lever Brothers Co. He was executive vice president and director of S. C. Johnson & Sons.

JAMES J. KERRIGAN, elected president of Merck & Co. He has been a vice president of the company since 1927 and is a director.

FORD BALLANTYNE, JR., recently named a vice president of Wyandotte Chemical Corp.

CHARLES N. KIMBALL, elected president of the Midwest Research Institute. He was previously technical director of the research laboratories of the Bendix Aviation Corp.



L. J. RICHARDS (l.), named director of engineering, The Dow Chemical Co. He has been chief engineer of the Midland Division.

RALPH W. BOST, University of North Carolina, who has been presented the 1950 Herty Medal for contributions to chemistry in the Southeast.

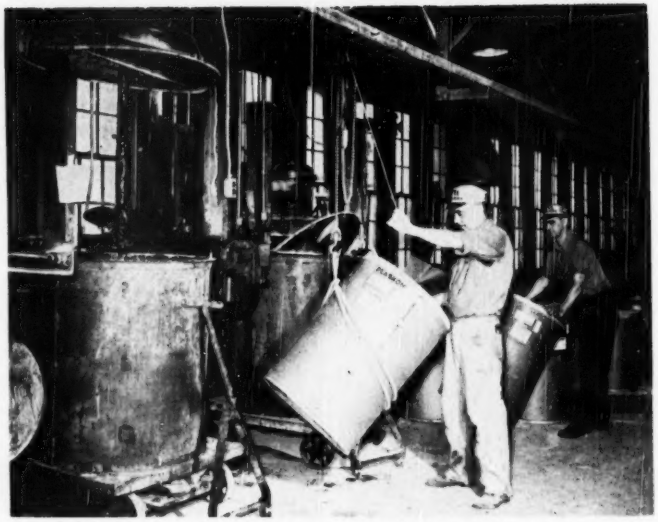
HOLDS SAND TIGHT

Synthetic abrasive binder replaces animal glue, adds life to sandpaper.

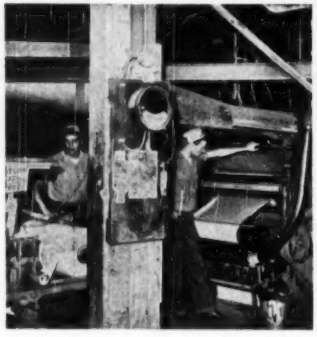
A NEW phenolic abrasive binder has been introduced by the Plaskon Division, Libby-Owens-Ford Glass Co., Toledo, Ohio.

Urea and phenolic resin adhesives have been found to have much greater strength of bond and resistance to heat generated when in use than the animal glues originally used in making abrasives. The new phenolic binder is reported to have increased the life of one type of sandpaper to about 1,000 hours. The average life of the same type when animal glues were used was about 35 hours.

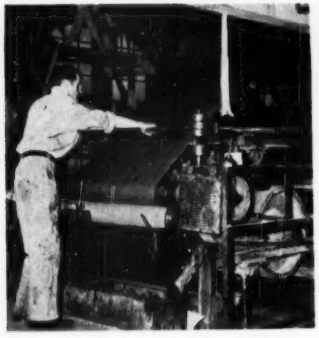
In addition, the quick-setting characteristic of the phenolic binder and its fast rate of cure allow a reduction in over-all drying time for the sandpaper, eliminating equipment previously needed, and reducing space required.



Plaskon phenolic resin binder is mixed in large vats at Abrasive Products plant, South Braintree, Mass. Use of this resin has increased the average life of sandpaper almost 3,000%.

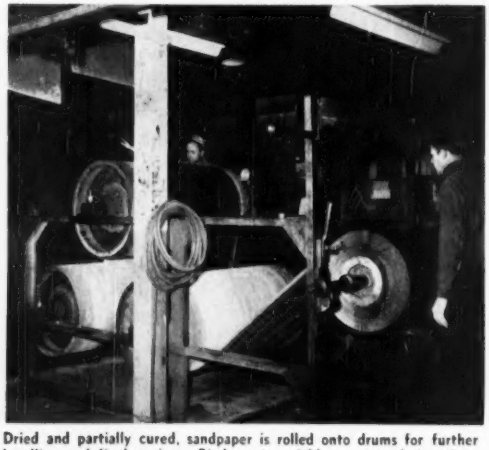


"Making" step in process is addition of glue to paper to hold abrasive grits on wet surface.

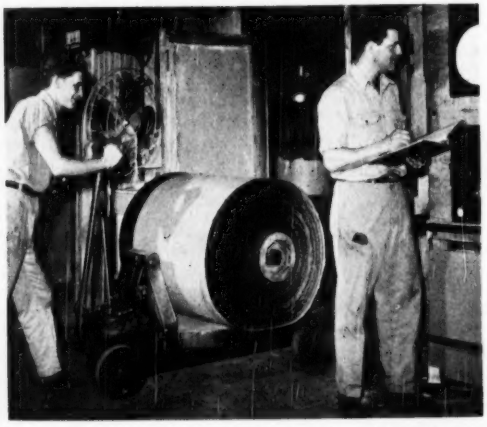


Sizing coat of phenolic binder is applied over abrasive particles to provide added bond.

Next sandpaper runs through festooning setup in drying room. Binder here begins to cure.



Dried and partially cured, sandpaper is rolled onto drums for further handling and final curing. Binder sets quickly — cuts drying time.



Rolls enter oven for baking that accelerates and completes resin cure. Rolls are then slit into proper sizes for packing and shipping.

In the laboratory — in the plant — BECKMAN pH CONTROL can be used in many valuable ways!

THE BECKMAN MODEL H-2 pH METER is one of a complete range of Beckman pH Meters available for every type of application*. The H-2 is particularly recommended for applications where high accuracy and simple operation—combined with the convenience and low cost of 115-v. AC operation—are desired.

It provides instant and direct pH readings, and a simple, built-in dial permits quick, convenient temperature compensation over the entire range of 0° to 100°C (32° to 212° F.). High reading accuracy is assured by wide-spread dual range scale that reads from 0 to 8 pH or from 6 to 14 pH at the turn of a switch. Same switch also provides instant millivolt readings from 0 to ±800 mv and from ±600 to ±1400 mv for titrations and oxidation-reduction measurements.

Built-in electrode support and compact case design save valuable space and permit easy portability to various plant locations.

Particularly important is the wide range of factory-sealed, maintenance-free Beckman Glass Electrodes available for use with this instrument . . . electrodes that are virtually unbreakable . . . that cover extreme temperature ranges from below freezing to above boiling . . . that have an unprecedented pH range with negligible errors . . . that are abrasion-resistant and chemically durable to a degree never before thought possible in glass electrodes.

*In addition to the H-2 Meter, other Beckman pH equipment includes completely automatic pH indication and control instruments for large-scale process applications . . . battery-operated models for complete portability in plant and field use . . . and a laboratory type instrument that features maximum versatility and accuracy for research and laboratory applications

In virtually all types of chemical laboratories—both in industry and science—Beckman pH instruments are playing an increasingly important role in simplifying operations, reducing processing costs, increasing uniformity and quality of the finished product.

Most laboratories are already familiar with the unique advantages of Beckman electrometric methods in making pH measurements . . . the far greater accuracy, speed and simplicity of making pH determinations without human errors in color judgment and free from the other inaccuracies and inconveniences of colorimetric methods. But many laboratories are not fully aware of the other useful ways Beckman pH Meters can be used in modern laboratory and industrial chemistry.

For example, Beckman pH instruments can also be used to obtain greater accuracy and convenience in various types of titrations and end-point determinations . . . they can be used for making a wide range of millivolt readings . . . and a varied selection of special-purpose Beckman electrodes permits many other types of electrochemical measurements to be made, quickly and accurately.

In fact, the great variety of Beckman Glass Electrodes—the most rugged, most advanced and most diversified in the industry—permits the utmost versatility in the application of Beckman pH Meters. These electrodes cover the complete temperature range from below freezing to above boiling, can be used at even high pH values with negligible sodium errors, are factoty sealed (require no maintenance) and are unusually resistant to alkalis, acids and rough treatment.

Among the many Beckman pH Meters available, the Model H-2 Meter illustrated above is most popular for general use. A few of its many unique features are outlined at left. For further details on this and other Beckman instruments see your authorized Beckman dealer, or write direct.

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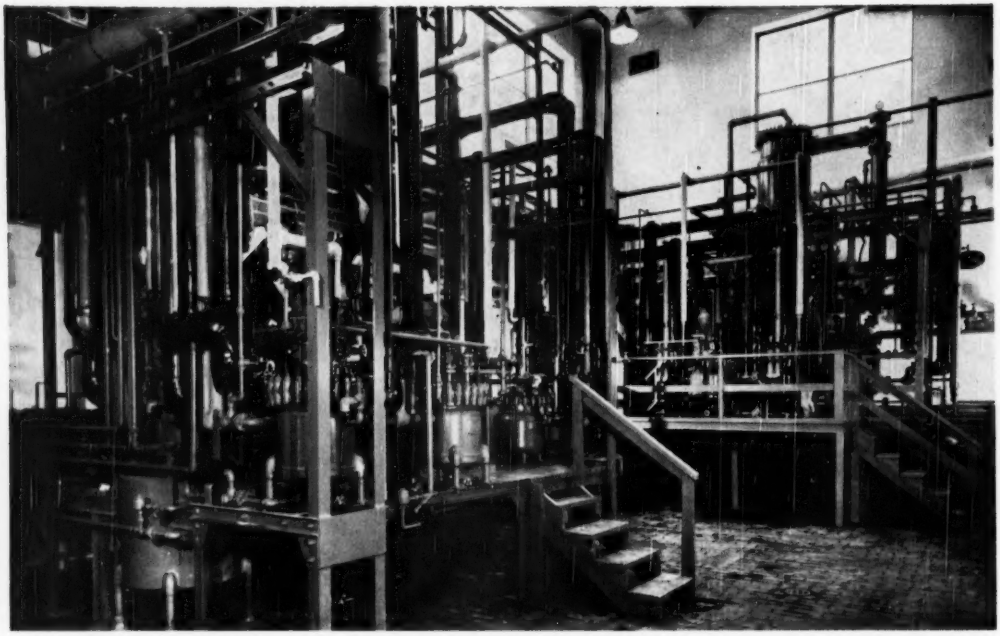


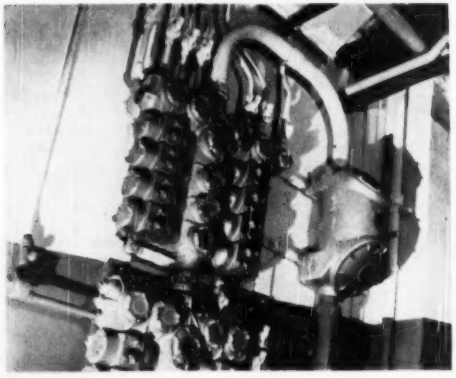
High-pressure lab, located in a detached room below ground level, is separated from the manufacturing unit by a three-foot concrete wall. It houses specially designed autoclaves for reactions requiring high pressure and temperatures, as well as hydrogenating equipment.

PUTTING ON PRESSURE

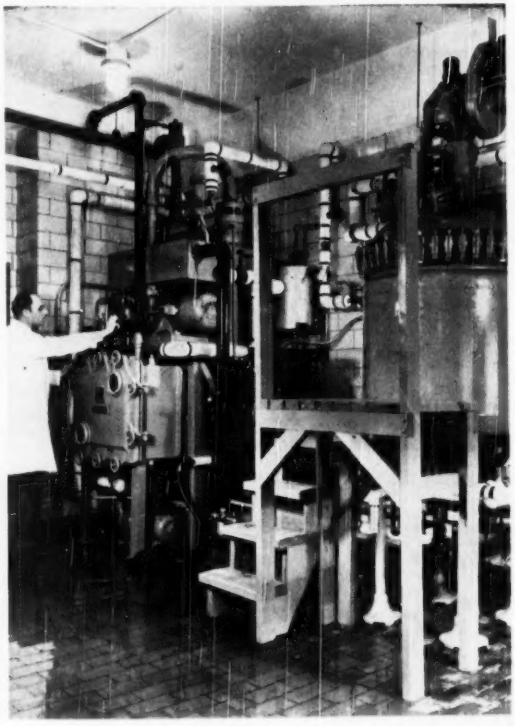
Sterling-Winthrop's underground laboratory permits study of high-pressure organic reactions.

RESEARCH in organic chemicals at pressures ranging from high vacuum to 5,000 pounds per square inch will be undertaken in a new group of laboratories of the Sterling-Winthrop Research Institute, Rensselaer, N. Y.

The group includes an underground lab which will permit research under high pressure for development of intermediates useful in the preparation of medicinals, such as heart stimulants and analgesics. High pressure chemical reactions will be undertaken by remote control below ground level.



All equipment is explosion-proof including switches (above), lights, and telephone. Blow-out windows have been installed also.



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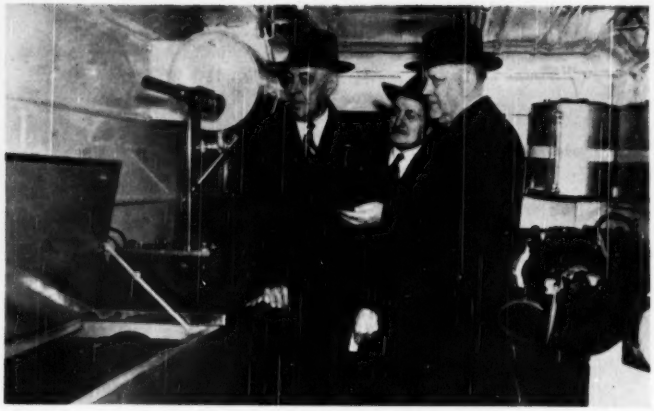
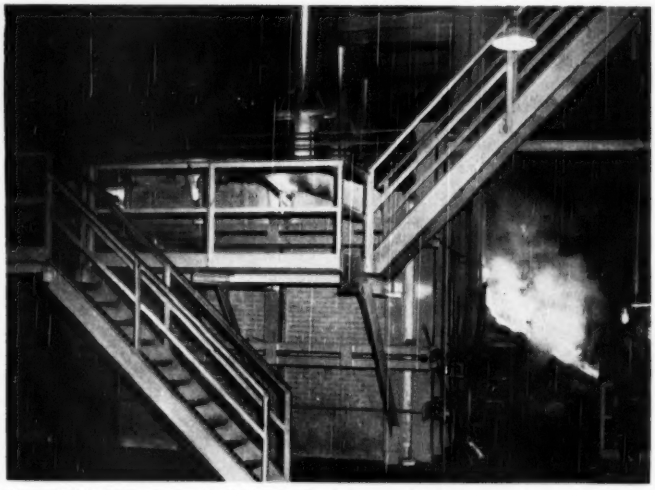


MSA electrostatic sampler, used in atmospheric sampling for dusts, fumes and smoke at Pennsylvania's new air pollution lab, is examined by N. W. Vaux, Joseph Shilen and G. H. Deike, Sr.

Pennsylvania's new air pollution and industrial hygiene mobile laboratory, the only one of the type in the country, has just been placed in service by the State's Bureau of Industrial Hygiene.

The laboratory, designed by Mine Safety Appliances Co., Pittsburgh, is equipped with more than 25 devices for field sampling and quantitative and qualitative analyses of atmosphere in industrial communities and factories. It is in a closed route van-type body, and has a gasoline motor-driven generator for electrical service and fresh and distilled water tanks. Two low-pressure gas tanks supply fuel for Bunsen burners.

MORE SILICATES



Diamond Alkali Co.'s new 50,000-ton gas-fired furnace during the "tapping out" process.

Diamond Alkali Co. has recently put into full-scale operation a new 50,000-ton furnace at its Cincinnati, Ohio, silicate plant. It is expected that the new furnace will increase production of silicate of soda and related products by 50 per cent. Total cost of the project was $300,000.

The plant now has three 50,000-ton furnaces. Diamond attributes this latest expansion primarily to the growing demand for silica gel catalyst.

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For Your Information

Every month Monsanto publishes these pages of pertinent information, selected to help you improve your products, lower your production costs, increase your sales. Detailed information on products listed on these pages . . . or on any of the more than 400 Monsanto Chemicals and Plastics . . . will be sent promptly upon request.

MONSANTO SANTICIZER 141 ACCEPTED BY BAI FOR USE IN FOOD WRAPPINGS

Polyvinyl chloride film, plasticized with Santicizer 141, heat-seals easily and securely.

Based on the results of feeding and extraction tests extending over two years, the Meat Inspection Division of the Bureau of Animal Industry, United States Department of Agriculture, has accepted Santicizer* 141 as a plasticizer for synthetic plastic films used to pack food products. This is positive proof of the non-toxicity of Monsanto Santicizer 141 . . . proof that Santicizer 141 is the plasticizer to use in any application where non-toxicity is required.

The BAI acceptance of Santicizer 141 opens new fields for the use of synthetic plastic chloride films. It suggests the use of these films in packaging meats, cheese, margarine and scores of other products affected by the trend to self-service in food stores.

Polyvinyl chloride film, plasticized with Santicizer 141, is tougher than most other films, hence, less likely to tear. It provides excellent protection because it heat-seals easily and securely. With Santicizer 141, it is possible to make film that is easy to print and process and which has excellent low-temperature flexibility.

For further information on Santicizer 141, mail the coupon or contact the nearest Monsanto Sales Office.

Monsanto HB-40 cuts cost in plasticizers

Monsanto HB-40 (partially hydrogenated terphenyl), used as an extender for primary plasticizers, cuts costs substantially for manufacturers of vinyls. HB-40 is low in price and a high percentage of the total weight of plasticizer can be used.

HB-40 is extremely low in toxicity. Being practically water-white, it can be used in transparent and brilliantly colored products. It has excellent electrical characteristics and moisture resistance. Non-migratory HB-40 gives a dry hand and increases tensile strength. For technical data and quotations, mail the coupon or contact the nearest Monsanto Sales Office.

Research Chemists' Corner

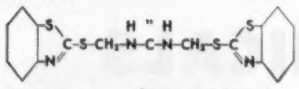
You may find something new here

Di-benzothiazyl-dimethyl thiolurea may be just the chemical you're looking for to help you in developing something new. Perhaps you can see the chemical's possibilities simply by looking over the specifications below. Maybe you'd like to do some experimenting. If you would, mail the coupon and we'll send you a sample without charge and without putting you under any obligation.

di-benzothiazyl-dimethyl thiolurea

1,3 bis(2-benzothiazolylmercaptomethyl)urea (Chemical Abstracts name)

Structure:



Appearance:	Cream-colored powder
Fineness:	99.5% thru 200-mesh
Moisture:	Less than 1.0%
Ash:	Less than 0.7%
Melting Point:	220° C. Min.
Specific Gravity:	1.29 at 25° C.
Solubility:	Very low for all solvents. Slightly soluble in hot pyridine and orthodichlorobenzene. Very slightly soluble in acetone, alcohol and chloroform.

World's best line of alkyd resin-producing materials available

If alkyd resin making is an activity under your direction, it will be worth your while to investigate Monsanto's line of materials . . . the *best* line to be found anywhere. Make Monsanto *your* supplier and you will be sure of getting products of highest quality, plus dependable service.

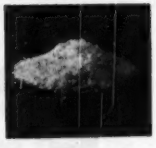
Monsanto's alkyd resin-making materials, which also have numerous other uses, are:

BENTHAL* (Alkyd Resin Intermediate) . . . A technical benzoic acid, containing 5% phthalic anhydride. It reduces viscosity, allowing reduction of acid value, retards yellowing, improves stability and flow.

MALEIC ANHYDRIDE . . . A versatile intermediate used alone or with other acids in making alkyd-type resins. Available from Monsanto as briquettes, flakes or solid.

TRIPHENYL PHOSPHITE . . . A color stabilizer in pale-colored alkyds and other products.

PHTHALIC ANHYDRIDE . . . An intermediate in making plasticizers, alkyd resins and numerous other products.



For further information on any or all of these products, indicate your wishes on the coupon or contact the nearest Monsanto Sales Office.

Source of quality phosphates to use in quality products

Quality ingredients are an assurance of quality finished products. That's why many manufacturers who require phosphoric acid and phosphates rely on Monsanto. These Monsanto products are derived from Monsanto-produced elemental phosphorous. From this pure phosphorous, quality-controlled Monsanto processes bring you phosphoric acid and phosphates with the uniform, high quality that gives you dependable results.

Monsanto Phosphate Division products include:

PHOSPHORIC ACID — Food processing, pharmaceutical manufacture, sugar clarification and metal treatment.

TRI SODIUM PHOSPHATE — A white crystalline material, uniformly sized, quickly soluble in water giving an alkaline reaction. pH value of 1% solution, 11.8. Used in household and industrial cleaners and detergents . . . in fruit cleaning and water softening.

MONO SODIUM PHOSPHATE — A white powder. pH value of 1% solution, 4.5. Used in water conditioning and acid cleaners.

DI SODIUM PHOSPHATE, ANHYDROUS — In granular or powder form. Soluble in water; insoluble in alcohol. pH of 1% solution at 25° C., 8.8. Used for water conditioning, cheese processing, condensed milk stabilizer and industrial cleaners.

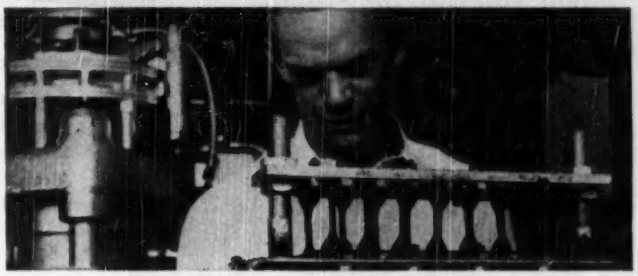
TETRA SODIUM PYROPHOSPHATE — White granular or powdered material. pH value of 1% solution, 10.2. Used in textile processing, in household and industrial cleaner and detergent mixtures, metal cleaning, as a soap builder.

SODIUM TRIPOLYPHOSPHATE — A white powder, quickly soluble in water. pH of 1% solution, 9.6. Used in manufacture of cleaning compounds and as a soap builder.

Other Monsanto Phosphates

Sodium Acid Pyrophosphate
Mono Calcium Phosphate
Di Calcium Phosphate
Calcium Pyrophosphate
Tri Calcium Phosphate
Mono Ammonium Phosphate
Di Ammonium Phosphate
Mono Potassium Phosphate
Di Potassium Phosphate
Tri Potassium Phosphate
Tetra Potassium Pyrophosphate
Hemisodium Phosphate
Magnesium Phosphates
Aluminum Phosphates
Iron Phosphates
Alkyl Acid Phosphates
Alkyl Alkali Phosphates
Special Phosphates

HOW MANY TIMES CAN A TIRE FLEX ITS MUSCLES?



Flexometer, above, is testing various rubber compounds in the Monsanto Rubber Service Laboratory.

Monsanto's Rubber Service Laboratory, in Akron, Ohio, quickly comes up with the right answers to such questions as: "How many times can a tire flex its muscles?"; "How long will soles wear on tennis shoes?"; "What rubber compound is best for V-belts?" . . . and many others.

The laboratory serves the rubber industry exclusively. Results of its work have brought forth many advancements in the formulation of natural, synthetic and reclaimed rubber compounds. If you are a manufacturer with a problem concerning rubber, you may submit it to the Monsanto Rubber Service Laboratory . . . without cost and without obligation.

Monsanto produces a long list of chemicals for the rubber industry, including antioxidants, accelerators, wetting agents, reodorants, stabilizers and colors. For information on rubber chemicals, mail the coupon.

Santobrite stops mold in soap wrappers

Mold in soap wrappers long has been a problem with both soap makers and paper manufacturers. Now Monsanto Santobrite* (sodium pentachlorophenate, technical) has been proved to be a means of eliminating the difficulty in casein-coated papers. As little as 0.2% of Santobrite, based on the weight of casein in the size, stops mold discoloration. The addition of Santobrite to the paper stock and to adhesives also is recommended.

Get the bulking you want with SANTOMERSE No. 1

If you want to give your product bulk with light weight, Monsanto Santomerse* No. 1 will help you get it. If you want weight but little bulk, Santomerse No. 1 fits into your plan. If you are seeking a compound that falls between these extremes, Santomerse No. 1 will be useful to you.

The reason: Santomerse No. 1 is available in three weights, drums of the same volume weighing 175 pounds, 200 pounds and 225 pounds.

*Reg. U. S. Pat. Off.

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☐ Rubber Service Laboratory
☐ Rubber Chemicals
☐ Santobrite for soap wrappers
☐ Santicizer 141 ☐ HB-40
☐ .....

Sample

☐ Di-benzothiazyl-dimethyl thiolurea

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HC-COOH

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POLYESTER RESINS
COPOLYMERS

PFIZER QUALITY

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Manufacturing Chemists for Over 100 Years

PROPERTIES

Appearance .....White, non-hygroscopic, free-flowing crystalline powder
Melting Point.....290-295° C.
Solubility in Water at 25° C....0.70 gm./100 ml.
Solubility in Water at 100° C...9.80 gm./100 ml.
Solubility in Ethyl.....5.75 gm./100 ml. Alcohol at 30° C.
Solubility in Acetone at 20° C..1.29 gm./100 ml.

REACTIONS

Fumaric acid exhibits the usual reactions of dibasic acids forming salts, acid salts, esters, acid esters and amides and will undergo reactions at the double bond which is activated by two carbonyl groups in conjugated positions. Although fumaric acid itself will not polymerize, its esters will undergo this reaction. Linear, thermoplastic polymers may be prepared by polymerizing the esters of monohydric saturated alcohol. These esters also may be copolymerized with other monomers. Three-dimensional, thermosetting polymers may be synthesized by condensing fumaric acid with polyhydric alcohols

USES

Alkyd Resins—The replacement of 3-5% phthalic anhydride with fumaric acid accelerates cooking—a few hours against 12 to 20—and permits the preparation of a more viscous product. Drying time with this preparation is usually speeded and colors enhanced. "Adducts" formed by reacting fumaric acid and rosin when condensed with polyhydric alcohols form "hard" resins with high melting points.

OTHER USES

Fumaric acid may be used in the preparation of polyester laminating resins. Esters of fumaric acid may be copolymerized with a number of other reactive monomers including vinyl chloride, vinyl acetate, methyl methacrylate and styrene to form a number of interesting copolymers.

Fumaric acid furthermore may be used as a raw material for the preparation of surface active agents, as a leavening agent and as a laxative. Write today for further information, samples and prices to: Chas. Pfizer & Co., Inc., 630 Flushing Avenue, Brooklyn 6, N.Y.; 425 North Michigan Avenue, Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.

From Chemical Laboratory to Agricultural Markets

by MELVIN GOLDBERG
Pesticide Advisory Service, New York, N. Y.

LAUNCHING AN INSECTICIDE is a special market development problem involving accumulation of toxicological and insecticidal data to meet governmental requirements. A look at toxaphene shows how it is done.

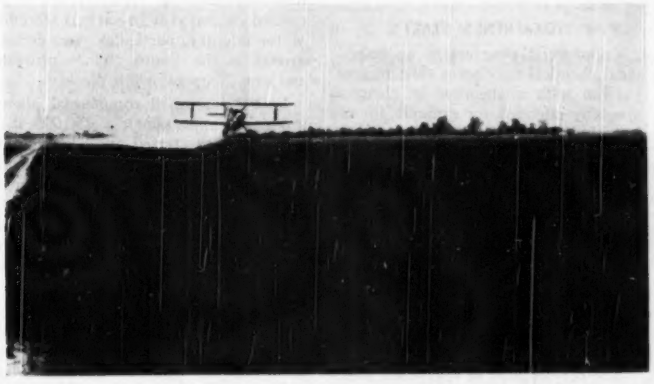
DEVELOPMENT of an insecticide from a chemical in the laboratory to a finished product for use in agriculture or the home is a complicated process. Primary cause for the difficult nature of such product development is that the materials are evaluated on their effect on living things: insects that must be controlled, plants or animals that must not be harmed, and people who must be able to use the chemicals safely and, in the case of food produced with their aid, consume it without danger of poisoning. The data necessary to determine whether a chemical meets these many requirements are gathered only over several growing seasons and after long-range biological tests, and the producer has to meet exacting governmental regulations before he can market his material.

A manufacturer who has a material he thinks may be of use as an insecticide, will run preliminary tests to determine its entomological effectiveness. If these substantiate his beliefs, and further evaluation of this type, combined with preliminary tests of its toxicity toward higher animals, is encouraging, he will probably move the product from the laboratory to pilot plant.

When pilot-plant quantities of the insecticide-to-be are available, initial samples are generally sent to the U. S. Department of Agriculture Bureau of Entomology and Plant Quarantine. This agency, the fountainhead of activity in this field, is the starting point for determination of chemical and physical properties and entomological effectiveness. It begins work on the material in its own laboratories and fields.

Concurrent tests on toxicity are started by the company or its consultants as well as by independent institutes, and approaches are usually made to the U. S. Public Health Service of the Federal Security Agency at this time. There are at least two bureaus within this Federal agency—Food and Drug Administration and Division of Industrial Hygiene—which are interested in toxicity from a public health point of view. The company will present samples of the chemical to these agencies along with whatever data it has accumulated at this stage.

CATTLE SPRAYS require extensive testing, must not harm animals or contaminate food.



COMMERCIAL APPLICATION to cotton was a milestone in toxaphene's history.

PILOT-PLANT STAGE

An experimental permit—more or less a statement of quantities of the material to be shipped to qualified investigators—is secured from the Production and Marketing Administration of the U.S.D.A., and pilot-plant quantities of the technical material or formulations of it are then given to state experimental stations along with recommended dosages evolved by the manufacturer's entomologists. For example, if the material shows promise in cotton, these samples will be given to Federal laboratories in the field as well as to individual state cotton research laboratories. Every cotton state in the South has its own experiment station which may work independently or in conjunction with the Federal cotton laboratories. If the material shows promise in the animal pest control field, samples of the technical as well as formulated chemical are sent to lab-

oratories, both Federal and state, which make this type of work their major activity.

Generally it requires one to two years for small-scale tests, possibly on small field plots, to be carried out. Work by these various stations is done on formulating, entomological effectiveness, chemical and physical properties, and in some cases on toxicity. Reports on their results are usually transmitted back to the company as well as delivered at the many regional and national meetings of the American

John Powell & Co., Inc.

REARING INSECTS is an important activity of an insecticide testing laboratory.

Association of Economic Entomologists. These data are published in such journals as the Journal of Economic Entomology and trade magazines or state entomological bulletins and reports. All of these results, of course, are made available to the Bureau of Entomology and Plant Quarantine, which as indicated, is the clearing house for this type of information.

The formulator who has followed the progress of this research on a new promising chemical in published reports and at scientific meetings naturally wants to put out a finished insecticide containing it. Before he can place such a product on the market, he must draw up a label telling the name of the product, name and address of the manufacturer, net contents, ingredient statement (designating active and inert materials), warning or caution statement, directions for use, etc. This is presented to the Insecticide Division of Livestock Branch, Production and Marketing Administration, U.S.D.A., in Washington.

These labeling people rely first on the Bureau of Entomology and Plant Quarantine and secondly, on the Food and Drug Administration to see how the material may be used. The Bureau must approve and generally disseminate bulletins describing various permitted applications for a given chemical. FDA, of course, exercises authority over the inherent danger if it is going to be used on an edible product. Coordinating such activities is an Interdepartmental Committee on Pest Control. This committee, originally set up to keep the many Government branches informed of technical advances of interest to their work, has been of value to manufacturers in expediting insecticide registration.

If the Production and Marketing authorities find that the claims the manufacturer makes for the insecticide when used as directed are supported by the information of its advisory agencies, his formulation is approved for distribution. In addition to these Federal requirements, most states have provisions calling for registration of economic poisons, including payment of a registration fee, before the material can be sold within their borders.

TOXAPHENE'S START

Commercial progress of an insecticidal chemical may seem slow in comparison with a chemical or chemical specialty intended, for example, for use in an industry producing metal castings instead of beef and vegetables. The importance of insecticides to national welfare, however, and the effectiveness of new organic chemicals in serving this need, have made the farm an expanding market for products of the chemical industry. An examination of the case history of one of these products—toxaphene—will show how one chemical company has shared in this trend, and how others can.

The development of toxaphene stems from the interest of Hercules Powder Co. in the stumps of southern pine—called "fatwood" in Georgia and Florida because they are so rich in turpentine. The company's naval stores division had extracted turpentine from this wood for many years, and, as a regular practice of these operations, had a long-range project of testing insecticidal properties of products obtained in such extraction. (Its Thanite—isobornyl thiocyanoacetate—was an earlier product of this research.) With the terpene radical as a starting point, many different compounds of varying insecticidal activity were possible, and the job was finding which was best from this standpoint without accompanying properties that could hinder its commercial accepance.

Shortly after the beginning of the Second World War, Hercules derived camphene from turpentine, and upon chlorinating it, ended up with a material that showed promising insecticidal activity against a wide number of insects. This was in March, 1944. As is customary in the early development stages, toxicological work proceeded concurrently with biological testing to find out whether the material could be handled with safety by research people and whether it seemed to have chronic toxicity. These toxological studies were made at Smyth Laboratories in Philadelphia, Columbia University and the Southwestern Medical College in Dallas, Texas. Preliminary evaluation was so encouraging that by January, 1945 other derivatives being tested along with chlorinated camphene were ruled out, and the decision was made to go along with this particular product, then known as compound 3956.

In July, 1945, a pilot plant was erected with an initial production sufficient to provide material for large-scale field tests. After initial production difficulties were ironed out, the material became available in early 1946. Field tests of toxaphene formulations were carried on that year in various sections of the country, particularly on cotton insects in the South and Southwest, and grasshoppers in the West.

In 1947, a small commercial plant, producing approximately 150,000 lbs. a month, was started and along with limited commercial use, additional large-scale tests were continued throughout the year. The next year, production of the technical material was doubled, and the story of enlarged facilities has been repeated each year since.

GROWING ACCEPTANCE

This record of continuous increases in production indicates acceptance of the material as an insecticide, particu-

What about crotonic acid

Crotonic Acid, with its conjugated double bond system, is highly reactive. Its derivatives have merit as **plasticizers, polymers and copolymers, flavoring, perfumes and chemical intermediates.**

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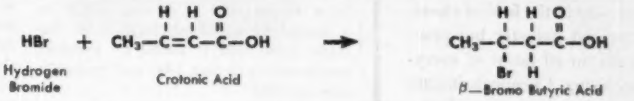
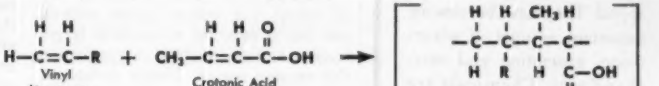
TYPICAL REACTIONS

Esterification

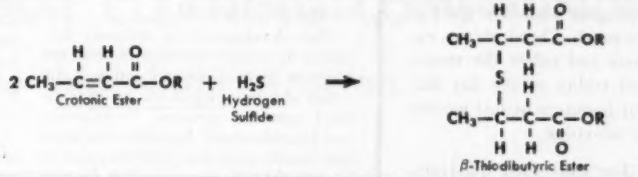
Hydrohalogenation



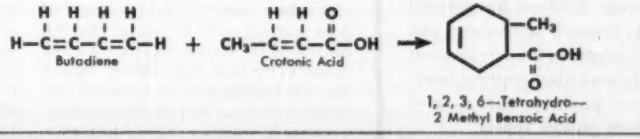
Copolymerization



Coupling



Diels-Alder Reaction



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larly for control of cotton insects which is the present major market. It is recommended by leading cotton-producing states for control of all the following major cotton insect pests in the United States: boll weevil, boll worm, cotton aphid, cotton fleahopper, cotton leafworm, southern green stinkbug and thrips. It was, as mentioned above, first used experimentally in this field during 1946 and 1947, and it was included for the first time in 1948 in the recommendations of the leading cotton growing states. It has since been adopted by practically every state agricultural organization for such applications.

In general, the recommendation calls for 10 pounds of a 20 per cent dust or spray per application per acre against the boll weevil, boll worm, cotton aphid, cotton leafworm and southern green stinkbug. For the cotton leafhopper, rapid plant bug, tarnished plant bug and thrips, 10 pounds of a 10 per cent dust per application is the usual recommendation. Where the red spider is present, it is necessary to include at least 40 per cent of dusting sulfur in a toxaphene formulation. It is in the latter form that it found its greatest use in cotton during 1949 and probably also in 1950.

At present the trend is toward use of sprays for cotton insect control, and this is expected to result in large-scale use of this method of application this coming season. Hence, toxaphene is being formulated as an emulsifiable concentrate. The usual formulation contains 4, 6, or 8 pounds of technical toxaphene per gallon.

This development of different formulas to control different insects, and different methods of application is the result of continuing work by agricultural agencies, growers, formulators, and Hercules itself. In cultivating markets for the material, great care had to be exercised to recommend it for use only where sufficient field testing had been carried out to prove effective control of the insects involved without injury to the crop. Information regarding safe handling of the technical material, as well as various formulations, were made readily available to formulators and users. Advice on proper labeling was supplied by the company.

Out of this program that is part of exploring completely the possibilities of any new insecticide, have come new uses. Because of toxaphene's promise in control of grasshoppers, the Bureau of Entomology and Plant Quarantine in 1948 recommended it for such use. Recommended application is 1-1.5 lbs. of toxaphene per acre when applied as a spray, or 1.5-2 lbs. per acres when applied as a dust. A bait of 1 lb. of toxaphene per 100 lbs. of bran is also recommended as a substitute for the standard sodium fluosilicate bait.

With the unfavorable publicity on the use of chlorinated hydrocarbons where milk and food contamination is possible, recommendations for the use of toxaphene for livestock pests were delayed somewhat. However, this year for the first time Federal authorities are recommending toxaphene for control of ticks, lice, hornflies, and sheep ticks on all livestock except dairy animals. Sprays of .5 per cent and dips containing as little as .1 per cent are suggested dosages.

This latter step was not taken, of course, until both authorities and Hercules were convinced that the material could be used effectively without harm to the animal or danger to the public that would be consuming the meat so produced. This necessitated a great deal of work on toxicity studies dealing with livestock, particularly beef cattle. Cooperative tests were run at the University of Maryland and also at Montana State College on the absorption of toxaphene when fed at certain rates to milk cows, beef cattle, and sheep. At the Kerrville, Texas, field laboratory of the Bureau of Entomology and Plant Quarantine, tests were run to determine absorption through the skin of cattle sprayed with toxaphene emulsion sprays. Additional tests are still underway at Texas. A. & M., and lifetime studies are being carried on on several species of animals at a private toxicological laboratory. When these tests are completed, the results will be reported in the usual manner, and they will probably be reflected in future use of the material.

FOREIGN MARKETS SOUGHT

Part of the continued search for new markets, and the long-term—and costly—research it entails is motivated by the nature of the insecticide business. Hercules has been beset with the same problem facing every other chemical manufacturing company going into this business: domestic demand generally runs from March through July. Every effort naturally has been made by these companies to establish a year-round industry. Therefore, Hercules has devoted considerable sales effort to development of the overseas market to even out as much of the boom and slack pattern as possible. To that end, it has sent several of its representatives into the African and South American market to teach the inhabitants in these areas the potentialities of toxaphene in insect control programs for important crops and livestock.

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with Wyandotte "high-light" Kreelon

In these competitive days, the *appearance* as well as the *performance* of a cleaning compound is important.

That's why more and more compounders are standardizing on Wyandotte "high-light" Kreelon in their formulations.

This superior detergent and wetting agent is white in color and makes a clear, practically colorless solution. Here's a simple test that strikingly demonstrates this quality. Simply dissolve a sample of Kreelon and one or a number of other detergents in separate beakers of water. Hold them up to the light. Note the clarity of the Kreelon solution. Compare it with the hazy, "muddy" appearance of most other detergent solutions.

Wyandotte "high-light" Kreelon is made under rigid manufacturing specifications. It provides maximum detergency (soil removal and whiteness retention). *And Kreelon contains a minimum of 40% active agent.*

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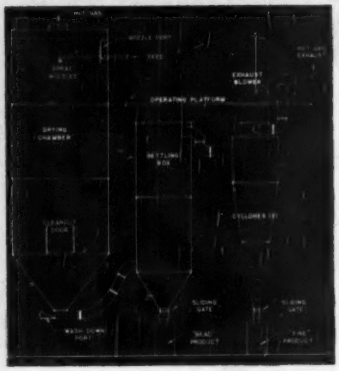

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CHEMICAL SPECIALTIES——

Paralleling the increase in production of toxaphene as its markets expanded has been a decrease in price. The original price of about 35 cents a pound in 1946 was reduced to 24 cents in 1947, and is currently 20 cents, f.o.b. works.

Major competitors to toxaphene at the present time particularly in cotton insect control are benzene hexachloride, DDT combinations and a relatively new compound which is being tried out this year on a large scale for the first time—aldrin, a product of Julius Hyman & Co. In the grasshopper field, chlordane and aldrin are potential competitors with cost of application ultimately being the factor to decide which will be used.

Toxaphene, in test to date, has shown great promise in the field of ticks, hornflies and other insects attacking cattle. No doubt when current Government hearings to establish certain tolerances are concluded and some of the unwarranted publicity directed at all organic insecticides dies off, toxaphene will find even greener pastures of use.

Better Bronzing Paints

A method for making superior ready-to-use or ready-mixed gold or copper bronzing paints, with increased stability of leafing and improved luster, is described by C. S. Fleming in U. S. Patent 2,474,520:

Glycerine	10 Gm.
Gold bronze powder	10 Gm.
Vehicle 1301	75 Gm.

In the above formula, Vehicle 1301 provides an all-purpose vehicle that is neither soft nor brittle and which is very suitable for making bronze paints. It consists of:

Bodied linseed oil	200 Gm.
Solution of polymerized resinous material	200 Gm.
Petroleum thinner	100 Gm.

Glycerine is said to combat the deleterious effects of the stearic acid coating commonly applied to the flaked particles of bronzing powder.

Statistics Available on Wood Preservation

"Preliminary Wood Preservation Statistics" for 1949 has been published by the Division of Forest Economics, Forest Service, U. S. Department of Agriculture. This statistical series, parts of which go back to 1909, is issued in cooperation with the American Wood-Preservers' Association.

The figures for 1949 are based on reports from 270 plants representing more than 95 percent of the wood treating capacity in the United States.

PRODUCED IN TONNAGE

as an ingredient for COSMETICS, CERAMICS, INK, PHARMACEUTICALS

as a filler for PAINT, VARNISH PIGMENTS, LACQUERS

as a filler for LINOLEUM, OILCLOTH, PAPER, TEXTILES

as an ingredient for RUBBER COMPOUNDING

as a free-flowing agent in SALT

as an ingredient in ANIMAL FEEDS

BAKER'S MAGNESIUM CARBONATE

with all these 6 vitally important qualities

- MEASURED PURITY
- UNIFORM DENSITY
- LOW IRON CONTENT
- LOW CALCIUM CONTENT
- PROTECTIVE PACKAGING
- AVAILABILITY

This widely used tonnage chemical is one of Baker's specialties. It is manufactured under precision control from the raws to the finished product.

Note the features of Baker's Magnesium Carbonate listed at the right. Long experience in cooperating with users of Baker's Magnesium Carbonate indicates that *all six* of these Baker features are essential to many industries.

Write for free testing samples and make your comparison. Address: J. T. Baker Chemical Co., Executive Offices, Phillipsburg, New Jersey.

Baker's

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

as well as
LITHIUM
METAL

The unique chemical and physical properties of Lithium Salts made inevitable their recognition and use in many specialized chemical applications. Their general low molecular weight and low melting eutectics with other salts are but two reasons for their ever increasing acceptance.

Lithium Salts have indeed demonstrated their value in the Ceramic, Welding, Chemical Manufacturing, Pharmaceutical, Air Conditioning, and Grease and Wax industries. Certain products produced by these industries largely owe their superiority to the distinct properties of Lithium Salts.

Look to Lithium Salts as a possible answer to your production problem. And when you consider Lithium, look to Metalloy as a reliable supplier. As specialists, Metalloy has developed many Lithium Compounds hitherto unavailable for commercial use.

Write Dept. A for prices, samples and further information.

LITHIUM
ALUMINATE
BORATE
CARBONATE
CHLORIDE
COBALTITE
FLUORIDE
HYDROXIDE
MANGANITE
MOLYBDATE
SILICATE
TITANATE
ZIRCONATE
ZIRCONIUM SILICATE

• *Available in tonnage or experimental quantities.*

If It's Lithium—Call Metalloy!

METALLOY CORPORATION
GAMB TOWER MINNEAPOLIS, MINN.

SPECIALTIES NEWS

New Wax Spec Issued

The revised specification under which the Federal Government buys water-emulsion floor wax has been approved, and has been issued by the Federal Bureau of Supply, Washington, D. C. The new specification, officially designated General Services Administration Specification, Floor Wax; Water-Emulsion, 784a, March 27, 1950, superseding 784, June 28, 1948, has been developed by the Bureau in conjunction with manufacturers who have aided in establishing suitable tests for such products. It is expected to be of interest not only to suppliers of water-emulsion floor wax who anticipate selling to the government and whose products must meet these requirements, but to wax manufacturers in general for whom the new specification will be a convenient gauge of their products' quality.

Mathieson Adds Units for Insecticides, Fungicides

Mathieson Chemical Corp. will begin production of agricultural insecticides and fungicides at Little Rock, Ark., and Williamston, N. C., shortly, with another plant at Houston, Tex., scheduled to come in a little later. All of the new units will be located in convenient proximity to Mathieson's fertilizer plants or distributing warehouses in those cities, and their readily accessible truck loading facilities will enable customers to pick up a combination load of fertilizers and insecticides at the same time.

Manufactured in accord with the recommendations of agricultural colleges, experiment stations and extension services, strict laboratory controls will be maintained to assure that each product manufactured is in accord with Federal and State label requirements. The products will be marketed under the "Gro-More" and "White Diamond" brand names.

D. R. Stoneleigh, newly appointed manager of the Agricultural Specialties Branch of the Agricultural Chemicals Sales Division, will have charge of the sales and distribution of products from the three new plants.

Kolker Chemical Buys Texas Plant Site

Kolker Chemical Works, Inc., Newark, N. J., has purchased twenty-five acres of land in the Houston, Texas, area where it plans to erect a plant for the manufacture of agricultural chemicals and organic chemicals for industry. The Houston site was chosen because of the availability of raw materials and the location of markets for finished products. The company is a basic manufacturer of DDT, 2,4-D and 2,4,5-T.

Robert W. Lull (left), named West Coast sales-service engineer for American Cyanamid Co.'s Paper Chemicals Dept.; and David Busker who has joined Better Finishes and Coatings, Inc. Mr. Lull has been with Cyanamid's Stamford Research Laboratories, and Mr. Busker has been associated with the Hilo Varnish Corp.

"What's New" Memo

Are you interested in printing inks? Disinfectants? Aerosol insect repellents and dog sprays? Silicone polishes?

You can't afford to miss these articles in this issue:

"Balanced Ink", p. 824.
"Tractable Chlorine", p. 825.
"Insect Ack-Ack", p. 828.
"The Glaze That Stays", p. 830.

Esso Dedicates New Wax Plant

Esso Standard Oil Co. dedicated a modern solvents de-waxing plant, which replaces with a continuous and automatic process the traditional manual wax-making operation, at its Bayonne refinery.

The new de-waxing unit, known as an M.E.K. plant, will produce 178 million pounds of wax annually and completes the latest general modernization of the 75-year-old plant, the oldest in the Esso Company and a specialty plant producing wax, lubricating oils and asphalt.

Eliminating a process of wax-making which goes back to the earliest days of oil refining, the new plant will permit Bayonne to maintain its position as one of the foremost wax-producing refineries. In the past, wax was separated from chilled oil in plate or frame presses. Solidified wax was retained on canvas cloth filters and the wax cake removed by hand scrapers. De-waxed oil flowed beneath the press and was processed into lubricating oils.

In the modern operation, a waxy feed stock is mixed with a solvent composed of methyl ethyl ketone—hence the name

Recommended reading for research chemists...

CONCISE, INFORMATIVE LITERATURE ON ARMOUR'S

"Chemicals from Fats!"

Whether you make cosmetics or germicides, crayons or rust preventatives, synthetic detergents or printing inks, polishing waxes or paints, carbon papers or plasticizers . . . you'll want to know more about Armour's versatile "Chemicals from Fats."

Write for the following free booklets to see how these high molecular weight aliphatic chemicals can help you.

Armeens*—Fatty Amines

The Armeens, high molecular weight aliphatic amines having alkyl chain lengths of 8 to 18 carbon atoms, and their water-soluble acetate salts, the Armacs*, are used extensively as ore flotation reagents and also as a base for many of the new high potency quaternary salt germicides. Their many other uses include cationic emulsification, synthetic detergents, penetrants and repellents.

Armids*—Fatty Amides

The Armids are high molecular weight aliphatic amides having alkyl chain lengths of 8 to 18 carbon atoms. These high-melting, wax-like nitrogen containing chemicals are used in printing inks as "all weather" anti-scratch materials. Other uses include emulsion stabilizers and thickeners, dye solubilizers for carbon paper, anti-blocks for plastics, chemical synthesis.

Arquads*—Quaternary Ammonium Salts

The Arquads are Armour's alkyl trimethyl ammonium chloride chemicals—ranging from water soluble to oil soluble. They have excellent germicidal properties and surface active properties; are effective also as cationic textile softeners and ore flotation reagents. Other uses include anti-static polishes for waxes, detergents, and alkaline cleaning compounds.

ARMOUR *Chemical Division*

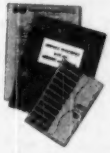
Armour and Company • 1355 West 31st Street • Chicago 9, Illinois

Ethomeens*—Ethomids*—Ethofats*

The Etho-chemicals are polyethylene glycol derivatives of fatty amines, fatty amides and fatty acids. These cationic and non-ionic chemicals have proven themselves particularly valuable as wetting agents, detergents, emulsifiers (and emulsion breakers), and as chemical intermediates.

The Chemistry of Fatty Amines

This twenty-page booklet gives detailed information on the fatty amines and includes sections on synthesis, saturated and unsaturated fatty amines, solubility, handling, quaternary ammonium salts, as well as on chemical coordination and substitution reactions, and cationic surface activity.



Technical Information Bulletins

Other informative bulletins are also available. Among them are: Bulletin #1B, "Armine Retarders and Anti-Scorching Agents"; Bulletin #2D, "Arneels as Plasticizers"; Bulletin #7E, "Sanitizing in the Frozen Fruit Concentrate Industry"; Bulletin #5F, "Compounding Detergents with Ethofat 242/25"; Bulletin #201, "Armid H.T. in Printing Ink"; Bulletin #202, "Armeens and Armacs as Cationic Emulsifiers"; Bulletin #203, "Armids as Mutual Solvents for Waxes and Plastics"; and Bulletin #204, "Armowax."

*Reg. Trademark U. S. Pat. Off.

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Please send me the booklets checked—

☐ Armeens ☐ Armids ☐ Arquads ☐ Etho-chemicals
☐ The Chemistry of Fatty Acids
☐ Technical Information Bulletins (specify) #_____

Name _____ Title _____

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Industrial Aromatics and Chemicals

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M.E.K. plant—benzol and toluol. This lowers the viscosity of the oil feed and accelerates the separation of wax from the oil. Rotary filters effect the actual separation.

Aerosol Suit Ruling Favors Bridgeport Brass

Latest development in a legal action of considerable interest to the aerosol industry is a reversal won by the Bridgeport Brass Co. in the U. S. Court of Appeals for the Second Circuit in its action charging the Bostwick Laboratories, Inc., and Connecticut Chemical Research Corp. with infringement of two of its aerosol patents. The court held that the recent decision of the District Court in favor of Bostwick and Connecticut Chemical Research against Bridgeport Brass was erroneous, and sent the case back to the District Court for further proceedings.

In its original action for damages against the two organizations, Bridgeport Brass charged infringement of its patents, No. 1,892,750 for "Method and Apparatus for Atomizing Materials" and No. 1,945,998 for "Coating Compositions." These cover inventions made by Eric Rothein, a Norwegian, who was a pioneer in the aerosol field. They were purchased several years ago by Bridgeport Brass for use in its aerosol operations.

Sterling-Winthrop Opens New Laboratory

A new laboratory building of the Sterling-Winthrop Research Institute at Rensselaer, N. Y., was opened last month.

The new laboratory is a four-story three-wing building. The center wing is for administration and is flanked by the chemistry and biological wings. There are lecture rooms, studies, library with 25,000 volumes, 24 chemical laboratories, four pharmacy laboratories, and 26 biological laboratories. The virus section is completely isolated from the rest of the building, and scientists enter only through air locks. An insectorium is another isolated unit intended for mosquito breeding and insecticide testing in malarial and other research.

Varley & Sons Builds Packaging Unit

James Varley & Sons, Inc., St. Louis, Missouri, has just completed a new packaging plant and warehouse on its premises at 1200 Switzer Avenue. This new building will be approximately 120 feet square, and will provide an additional quarter of a million cubic feet of storage space.

This modern concrete structure has latest type packaging equipment, and will handle all orders ranging from five gallon drums down to eight ounce bottles.

Grass-Killer Applied With Fertilizer

Tests conducted by The Dow Chemical Co. show that sodium TCA may be applied in a dry form mixed with fertilizer or other carrier such as super phosphate, dry sand or limestone. Application is made with a fertilizer spreader.

Sodium TCA, the efficient new grass killer, is conventionally applied as a spray treatment to suppress or control grasses.

As the result of tests Dow research workers suggest that the grass killer be applied with four parts or more of the carrier, and that the application rate be based on the sodium TCA content of the final mix. They also suggest that where possible, cultivation using a double disc harrow directly following application will help to attain uniform distribution. Application equipment should be cleaned thoroughly after use to prevent rusting and rubber gloves should be worn if sodium TCA is spread by hand.

Army Lets Anti-Freeze Contracts

The following Department of the Army contracts for ethylene glycol type antifreeze were let by Raritan Arsenal, Metuchen, N. J., recently: to Union Carbide & Carbon Corp., Nat. Carbon Div., New York, N. Y., for 245,000 gals. ($409,150); The Nutro Corp., Newark, N. J., 165,002 gals. ($283,753.50); The Nutro Corp., Englewood, N. J., 100,000 gals. ($168,500); E. I. DuPont de Nemours & Belle, W. Va., 123,750 gals. ($205,375.50); E. I. DuPont de Nemours & Co., Belle, W. Va., 74,250 gals. ($112,563).

"Surfactants" Coined for Surface-Active Agents

To put an end to the wide-spread and growing confusion between synthetic detergents and other related "surface-active agents," a new word, surfactants, has been coined by Antara Products, General Aniline & Film Corp., in the hope that the chemical industry will use it for all materials that have surface activity, including wetting agents, dispersants, emulsifiers, detergents and foaming agents. This new term is not copyrighted or trade marked. Its proponents urge that it be used for this general class of materials, allowing the word, detergent, to return to its original and correct meaning, a cleansing agent.

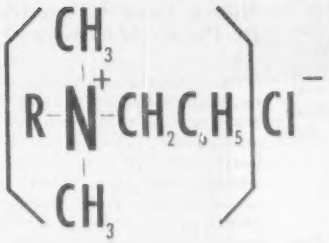
Horsefly Control Possible With Pyrenones

Three years of investigation of Pyrenone-type insecticide sprays, which in 1949 afforded dairy cattle protection against flies causing milk loss and an-

When You Specify QUATERNARIES

Remember...

Onyx BTC*



DISINFECTANT
•
DEODORANT
•
CONCENTRATED GERMICIDE

Sold as a 50% concentrate in aqueous solution.

Also available to meet U.S.P. requirements as BTC Brand of Benzalkonium Chloride, U.S.P.

Write for BTC* Bulletin
covering chemical and physical properties, germicidal, deodorizing and disinfecting action, toxicity and sensitization tests, etc.

1 The original industrial quaternary, alkyl dimethyl benzyl ammonium chloride, has been most thoroughly investigated and documented. It is the standard accepted quaternary for cationic germicidal uses, with proved performance in all sanitization and deodorization applications.

2 When you specify Onyx BTC* you can count on the results you will get, and you will have no worries about toxicity and skin sensitivity. Complete and authoritative studies have been made and widely published establishing germicidal activities, deodorizing properties, and proving that BTC* is non-toxic and non-sensitizing at all use-dilutions.

3 The complete stability of benzalkonium chloride (alkyl dimethyl benzyl ammonium chloride) is an established fact. When you specify Onyx BTC* you need never concern yourself about shelf life. BTC* is a specific chemical which does not deteriorate.

4 Onyx BTC* is made under rigid technical controls which insure the maintenance of its mixture of alkyl radicals at optimum bactericidal activity.

5 Onyx is the leading producer of quaternary ammonium compounds in the United States. BTC* is one of many Onyx quaternaries. Others are: lauryl isoquinolinium bromide, dialkyl dimethyl ammonium bromide, cetyl dimethyl benzyl ammonium chloride, alkenyl dimethyl ethyl ammonium bromide and alkyl dimethyl 3:4 dichloro benzyl ammonium chloride.

*Trade Mark Reg. U.S. Pat. Off.

onyx

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INDUSTRIAL DIVISION
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noyance, reveal that control with the Pyrenones can now be effectively extended against horseflies, according to U. S. Industrial Chemicals, Inc.

Toxicological examinations have determined that the Pyrenone materials are free of hazards to warm-blooded animals and will not contaminate milk, and consequently may be used directly upon the animals. Formed by combinations of piperonyl butoxide and pyrethrins, the Pyrenones are included in government recommendations of oil base and water emulsion insecticides for use on cattle and in dairy barns.

Most Pyrenone-type emulsion concentrates now on the market are formulated to contain 10 per cent piperonyl butoxide and one per cent pyrethrins. Such formulations, diluted 1 to 19 with water, give a finished spray containing 0.5 per cent of piperonyl butoxide and 0.05 per cent of pyrethrins. The tests demonstrated that this concentration protected sprayed animals for average periods of 8.1 days against horn flies, 5.3 days against stable flies, and 2.8 days against horseflies. The results in horsefly control were regarded as particularly meritorious in that insecticides or repellents have not been effective in giving livestock such protection.

Economics Lab Buys West Coast Plant

Economics Laboratory, Inc., St. Paul, Minn., has purchased a new plant in Santa Clara, Cal. Comprising 22,000 square feet on a 2½ acre site, the new plant began manufacturing operations in March. This first western manufacturing operation established by the company is expected to expedite deliveries in that area.

The plant will not produce any chemical raw materials. Products manufactured will include Super Soilax, Soilmaster, Tetrox, Pan Dandy, and Silva-Dry, sold for institutional food utensil sanitation, and the following packaged products distributed through retail channels: Soilax; Electrasol for home dishwashing machines; Fun Soapthetic and Tumble Suds for automatic laundry machines.

Non-Members May Now Buy CSMA Compilation of Laws

The Compilation of Laws, a reference book covering all state and Federal laws on insecticides, fungicides, weed killers, rodenticides, and disinfectants, which has previously been available only to members of the Chemical Specialties Manufacturers Association, 110 East 42nd St., New York 17, N. Y., can now be purchased from that organization by non-members for $25 per copy. Edited by John D. Conner, Washington attorney, the book is a loose-leaf edition for which additions and corrections are issued annually, thus keeping it up to date.

George O. Linberg (left), former sales manager and assistant to the director of the Textiles Chemical Dept., Monsanto Chemical Co., elected vice president and director of Belle Chemical Co.; and William H. Lycan, research director of Johnson and Johnson, elected to the company's board of directors.

Mildew Growth Prevented By Paradichlorobenzene

Paradichlorobenzene, heretofore used to control the clothes moth, has also been successfully employed to prevent mildewing of stored wool, cotton, leather and paper products. Laboratory tests by Monsanto Chemical Co. have confirmed earlier indications that mildew, or mold growth, can be stopped by the proper use of Santochlor, the company's paradichlorobenzene. Home studies have also demonstrated its effectiveness.

Roland S. Shumard, in charge of the company's industrial preservative group, said that the tests had been conducted with molds commonly found on household objects. A closet of about 100 cubic feet, relatively air tight, was completely protected for two years using about one pound of Santochlor during the hot months and about one pound for the entire winter season.

It is expected that this application will find year-around use in highly humid and warm areas, and during summer months in other areas.

A.S.T.M. Issues Booklet On Adhesives Standards

The second compilation of A.S.T.M. Standards on Adhesives (issued January 1950) has just become available. Sponsored by A.S.T.M. Committee D-14 on Adhesives, this publication contains in convenient form all 15 A.S.T.M. standards relating to this field. New material in this edition includes tests for: impact strength of adhesives; strength properties of metal-to-metal adhesives in shear by tension loading; and cleavage strength of metal-to-metal adhesives. Copies of this 60-page booklet, paper cover, can be procured from American Society for

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SHARPLES

Isobutylamine
Diisobutylamine

These two chemicals are suggested as intermediates particularly for:

Pharmaceuticals • Dyestuffs

PROPERTIES

	ISOBUTYLAMINE	DIISOBUTYLAMINE
Formula	$(CH_3)_2CH\,CH_2\,NH_2$	$[(CH_3)_2CH\,CH_2]_2\,NH$
Mol. Wt. Calc'd.	73.1	129.2
Specific gravity @ 20°/20°C.	0.73-0.74	0.74-0.75
Amine Content	97% (min.)	98% (min.)
Distillation:		
Initial Boiling Point	64°C. (min.)	—
95% between	64°-71°C.	134°-141°C.
Final Boiling Point	75°C. (max.)	—
Flash point	<20°F.	85°F.

For samples and technical information, Write Dept. A

SHARPLES CHEMICALS INC.

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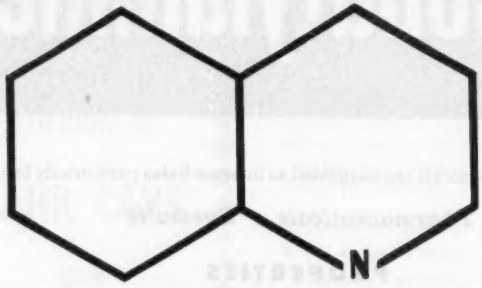
REILLY

Quinoline



An interesting organic chemical with many important applications

QUINOLINE is one of the more important coal tar chemicals produced by Reilly. One of the major applications of QUINOLINE is the production of nicotinic acid. The quinolinic acid produced by the oxidation of QUINOLINE is easily converted to nicotinic acid.

AMINOQUINOLINES are receiving increasing attention in the synthesis of organic compounds. The BZ-aminoquinolines are prepared by the reduction of the corresponding nitroquinolines. The 2-, 3-, and 4-aminoquinolines are obtained by reacting the corresponding chloro- or bromo-quinolines with ammonia or amines.

8-HYDROXYQUINOLINE, a fungicide of increasing importance, is made by caustic fusion of the quinoline sulfonic acid. Other applications of QUINOLINE include the manufacture of antiseptics, antipyretics and other pharmaceuticals, dyes, insecticides and rubber accelerators.

Reilly offers two grades of QUINOLINE—90% and 95% minimum purity. Both grades are available in quantity.

Your inquiry concerning QUINOLINE or any of the many other Reilly coal tar bases, acids or hydrocarbons will have prompt attention.

Reilly Coal Tar Chemicals For Industry

REILLY TAR & CHEMICAL CORPORATION

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Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $1.25 each.

Koppers to Make, Sell Emlenton Resins

Koppers Co., Inc., will manufacture and market the Resorsabond adhesives developed by the Emlenton Resins Co., Emlenton, Pa. No transfer of property or equipment is involved in the arrangement.

Under terms of the agreement executed at the request of Emlenton, Koppers will use the Emlenton formulations to supplement the variety of Koppers Penacolite Adhesives produced at the Petrolia, Pa., plant of the Chemical Division.

Company Notes

• **In addition** to light-sensitive stabilized diazo salts and coupling agents which it manufactures, Edwal Laboratories, Inc., Ringwood, Ill., has included in its line, as an accommodation to the trade, other commonly used coating ingredients.

• **Acheson Colloids Corp.**, Port Huron, Mich., has opened headquarters of its Dispersed Pigments Division at 420 Lexington Avenue, New York. This is separate from the company's Graphite Division New York office.

• **Phenolic varnishes and liquid resins** manufactured by the General Electric Co. at the Coshocton, Ohio, plant of the Chemical Department are now available to users outside the company. The varnish plant at Coshocton was completed in 1947 and has been used since that time for the manufacture of phenolic varnish and resin for use in manufacturing G-E laminated plastics made at Coshocton.

In addition to these laminating materials, the Coshocton varnish plant is now producing for outside customers phenolic liquid resins for use as foundry sand core binders and for rock and glass wool binders.

• **Twenty per cent emulsifiable formulaton of lindane** will be offered by The Dow Chemical Co., Midland, Mich., this season. Lindane is the chemical fly killer which the U. S. Department of Agriculture approved for use in dairy barns during 1949.

• **Canadian Aniline & Extract Co., Ltd.**, Hamilton, Ont., has put into operation another unit for production of synthetic detergents and ethanolamines.

• **Sharp & Dohme, Inc.**, Philadelphia, has moved its New York branch office into new, larger quarters in the Port Authority Building, 111 Eighth Avenue.

YOU get Versatility with ESSO SOLVENTS

Esso Solvents are being used more and more in a great many different industries such as—paint—textiles—rubber—chemicals—food packaging—leather—many others—where *versatility* plus dependability are required.

YOU CAN DEPEND ON ESSO SOLVENTS FOR

- **VERSATILITY**—dependable quality for a wide range of uses.
- **ECONOMY**—closely-controlled quality assures constant, efficient industrial processing, high-quality products.
- **UNIFORMITY**—made in modern refineries from carefully selected crude oil sources.
- **CONTROLLED EVAPORATION**—available in a wide range of evaporation rates with precise characteristics to meet your requirements.
- **SOLVENCY**—Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.
- **MODERN HANDLING METHODS**—separate tank storage, pumping lines, tank cars and trucks are used in all Esso Solvent handling operations. Prompt, efficient delivery to your door is assured.
- **MULTI-STORAGE AVAILABILITY**—Water terminals in many industrial centers.

Controlled high quality produces large profits with versatile, dependable Esso Solvents

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FOR TECHNICAL ASSISTANCE

If you have a solvents problem or want further information on the specifications and characteristics of Esso Solvents—write or call our office nearest you. Our technicians will be glad to assist you.

Test Your Knowledge of Lithium..

IS LITHIUM A SCARCE MATERIAL?

No. Lithium is twice as abundant in the earth's crust as lead, and four times as abundant as cobalt. Workable concentrations of its ores occur in the United States and many other parts of the world.

ARE LITHIUM COMPOUNDS COSTLY?

Again, no. First, lithium compounds perform many functions which are impossible with the traditional sodium and potassium compounds. Second, the lithium ion weighs approx. ⅓ that of sodium, and approx. ⅙ that of potassium: a factor to be considered. Third, developments in research and production have reduced the price of lithium compounds by about ⅔rds over the past 10 years.

HOW IS LITHIUM DIFFERENT FROM THE OTHER MEMBERS OF THE ALKALI GROUP?

Actually, lithium compounds have little in common with the other members of the alkali family. They combine many of the desirable properties of the alkaline earth group, and still retain some properties of the alkali family. For example, lithium differs from the alkali group in that its soaps are insoluble; a distinct advantage in the manufacture of greases. Also lithium halides are much more hygroscopic than the halides of sodium and potassium, and the common humectant calcium chloride: an advantage which is being rapidly exploited by the air conditioning industry.

WHY LITHIUM[F] COMPOUNDS ARE PREFERRED.

Lithium compounds to the (F)oote power represent the years of continuing research, production control, and experience which Foote Mineral Company packs in every shipment—a premium at no added cost. Put lithium[F] to work for you.

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Research and Development Laboratories: Philadelphia 44, Pa. Plant: Exton, Pennsylvania

NEW CHEMICAL SPECIALTIES

Note: This section limited to new finished specialties. New raw materials and intermediates of interest to specialties manufacturers are described in New Products and Processes department.

Emulsion Paint

Latex-based interior wall paint success in test markets.

Production facilities at Sherwin-Williams Co., 101 Prospect Ave., N.W., Cleveland 1, Ohio, and its allied companies are being expanded as rapidly as possible on a new emulsion copolymer type interior wall paint receiving ready acceptance in test markets. Based on a new latex formula, the new paint, called Super Kem-Tone, is guaranteed to be washable. It is said to form such an impermeable coating that dirt and soil wash off easily leaving the surface with its original beauty. Durability is shown by its having successfully passed tests of more than 65,000 strokes by automatic washing machines.

The new paint goes on equally well over plaster, brick, dry wall construction, wallpaper, and other known types of interior wall materials. It will cover properly prepared old paint surfaces, either flat or gloss, without primer or sealer. It dries in an hour.

Super Kem-Tone comes in many new colors including deep tones. It is ready to use, requiring no thinning, and may be applied equally well with brush or Roller-Koater.

Powdered Bleach

Gold Seal's product can be used on all fabrics.

Chicago is the first area being covered by Gold Seal Co.'s heavy promotion in a proposed national campaign for its new powdered bleach, trademarked "snowy bleach." It is claimed to have a pleasant odor, and to be safe for use on such fabrics as silk, nylon, rayon and wool. Other advantages cited by Gold Seal are that it is gentle on hands and can be used in washwater to save an extra bleaching operation.

"Snowy bleach" is packaged in a 20-oz. carton (to be sold at 49¢) which indicates convenience in carrying, storage and use. It will be sold through grocery stores and other retail outlets.

Fire Retardants

Chemical compounds make combustible materials flame-resistant.

A new chemical flame retardant, trade named Flamort, the development of San Francisco chemist Walter R. Hearst, is now available in several forms from Flamort Chemical Co., 746 Natoma St., San Francisco 3, Cal. Mixed with water, it is sprayed on unpainted wood, fabrics, paper or other combustible materials to make them flame-resistant. It is said to be approved by Federal, state and local authorities, and that several Federal agencies are using it.

Flamort T is sold for fine textiles; Flamort TC, for laundry and commercial use; Flamort Protextile, for flameproofing and mothproofing at the same time; and Flamort WC, for lumber and cellulose board. Water-soluble stains or dyes can be added to solutions, and rug shampoos and tints can be combined to give combination treatments. Dry cleaning solvents do not affect the treatment, but water removes it. Treatment is by spray, dip or sponge.

The materials are available as dry compounds in fiber drums and wooden kegs or as solutions in qt. and gal. bottles and in 5, 10, 16, 30, and 50 gal. kegs.

Antiseptic Detergents

Liquids are designed for cleaning and sanitizing institutions, etc.

Two liquid antiseptic-detergent concentrates, said to be highly effective in controlling fungi and bacteria, have been introduced by Piatt & Smillie Chemicals, Inc., 2329 Pine, St. Louis, Mo. Especially tailored to combine cleaning and sanitizing in one operation, the products are trade-marked First, a rug and upholstery shampoo, and First For Floors.

Both products, which contain a germicide manufactured by Monsanto Chemical Co., are said to eliminate odors caused by mildew and bacteria, in addition to reducing the hazards of athlete's foot and other infectious diseases. They are recommended for use in hospitals, hotels, schools, and the like. The two cleansers contain balanced amounts of wetting agents and synthetic detergents compatible with the sanitizing agent to loosen dirt and carry it away in suspension.

Nylon Size

Tests on nylon size favorable, result in plant-sized production.

Orthocryl 25, a nylon size, is now being made in plant-sized equipment by American Aniline & Extract Co., Inc., Venango and F Streets, Philadelphia, Pa., and is available in non-returnable drums. This is a 25% concentration, on which the price has been lowered from 62 cents a pound to 45 cents, f.o.b. Philadelphia. Orthocryl is also supplied in lower than 25% concentrations.

Development of the new size goes back to late 1947 when American Aniline began to make PM-90 size for thread sizing of nylon yarns for the full fashioned

SEND FOR THIS

This new bulletin contains useful information such as specifications, physical and chemical properties, and solubility and compatibility data for Barrett "ELASTEX" Plasticizers and Dibutyl Phthalate:*

"ELASTEX" 28-P Plasticizer (Dioctyl Phthalate)
"ELASTEX" 10-P Plasticizer (Diiso-octyl Phthalate)
"ELASTEX" DCHP Plasticizer (Dicyclohexyl Phthalate)
"ELASTEX" 50-B Plasticizer (Butyl Cyclohexyl Phthalate)
Dibutyl Phthalate

A copy will be sent you on request.

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Barrett

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industry and the tricot and weaving industries. This led the company to examine materials showing promise as a size for nylon and other heat-extruded fibers. In June, 1949, a promising candidate appeared, and a pilot plant for its production was installed. The first batch, produced last December, was applied to 40 denier yarns which were knit on a tricot machine with no shedding in either warping or knitting, the company reports. The second batch was applied on a slasher to 70 denier naked nylon warp of 100 ends which was woven without shedding, and indicated good loom efficiency. Further trials on thread sizing nylon yarn for weaving and on warp slashing from 48 ends for Marquisette through the satin and taffeta and twill range as well as spun nylon warps were conducted this January, and these results have warranted Orthocryl's present commercial production.

Brass Coating

Clear coating is easily applied, resists abrasion, humidity, salt spray.

A new anti-corrosive clear baking finish for brass and brass products has been developed by Standard Varnish Works, 2600 Richmond Terrace, Staten Island 3, N. Y. Named #7318 Clear Baking Finish, the new coating is recommended for builders' hardware, cosmetic cases, lighting fixtures, marine fittings, luggage hardware—wherever brass or brass plating is employed.

The material is resistant to abrasion, perspiration, humidity, and salt spray. It is easily applied by every type of application and baking method.

Rust Spot Remover

Product containing hydrofluoric acid for rust removal packaged in polyethylene bottle.

Rust-E-Lim, a new formulation to dissolve rust stains on fabrics, has been developed by Johnson Chemical Indus-

tries, Inc., Baltimore 26, Md., for distribution to the dry cleaning and laundry trade through jobbers and distributors. Containing hydrofluoric acid, it is packaged in a Plaxpak polyethylene bottle which eliminates leaky, corroded container problems. The bottle is non-shatterable and its pin-point opening enables the operator to use the correct amount of Rust-E-Lim accurately placed on small areas. Both insert plug for the orifice and closure are also of polyethylene. A telescoping outer container of cardboard prevents squeezing the bottle.

The material is formulated to remove the rust stains rapidly without harm to the fabric. Nationally distributed, 10 ounces sells for $1.25.

Di-Phase Metal Cleaner

Di-phase metal cleaning system based on organic solvent wetting agent.

A new, simple method for making and using di-phase metal cleaners said to have good detergency has been developed by Glyco Products Co., 26 Court St., Brooklyn, N. Y., which makes one of the in-

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Canners learned they could prevent the profit-stealing effects of enzyme action and heating by adding a trace of calcium salt . . . but they needed Calcium Chloride pure enough for food use. Mallinckrodt research developed the product—refined to remove harmful impurities such as arsenic and lead. Today the canners produce a greater proportion of premium quality grades at only a nominal increase in cost.

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gredients recommended. It is based on having a system in which the water and solvent remain as separate layers.

The solvent consists of a chlorinated solvent such as trichlorethylene to which is added mineral spirits to give a final specific gravity greater than the water layer which remains on top of the solvent. Phosphates are frequently added to the water to help clean water-soluble dirt from the metals.

Efficiency of this system depends on the addition of Glyco's polyethylene glycol 400 (di tri) ricinoleate S-556U, about ½%, to the solvent. S-556U acts as an organic solvent wetting agent for the metals, helping remove grease and oils from the metals rapidly. It also acts as an emulsifying agent when the metal parts are raised through the water layer, causing more effective removal of trace greases and other adhering dirt.

Cleaning is done simply by dipping the metal parts through the water layer into the solvent and then within a short time bringing them up through the water layer with a minimum of agitation or other mechanical cleaning methods. This system is not heated, thus avoiding difficulties with toxic fumes, fire hazard, loss of solvent and change in composition of the two phases.

Fluorescent Bleach

Powdered bleach acts on white and colored fabrics.

Fluorescent bleach in powder form is being marketed by Service Industries, 2103 E. Somerset St., Philadelphia, as Vivid. By eliminating the usual yellowish color found in fabrics after many washings, its action whitens white and intensifies colored fabrics. Not being a true bleach, it apparently is non-irritating to the skin and harmless to delicate fabrics. In addition it is odorless.

Packed as a powder in small fiber capsules, 1 capsule of Vivid dissolved in 1 gal. water makes a solution for 100 lb. (dry weight) clothes—hence, claims the company, is economical. A five to ten minute soak is effective. A $1 box contains 5 capsules.

Germicidal Detergent

Cleaning solution for personal safety equipment is effective, non-irritating.

A new cleaning solution for personal safety equipment such as goggles, respirators and helmets is being sold by American Optical Co., Southbridge, Mass. Combining the best properties of both a germicide and detergent, the #101 Germicidal Detergent removes dirt and deposited skin oils without inducing corrosion, staining or deterioration of rubber, plastic, or metal parts. The solution may be used as a spray, swabbing or immersion solution.

Odorless, the #101 also acts as a deodorant in certain cases. Tests have proved the new product to be neither a primary nor a secondary irritant, even after repeated usage. It is effective in hot or cold water, although increased temperatures will tend to aid its effectiveness and reduce cleansing time.

Available in gallon containers or 2 oz. bottles packed 10 to a carton, a gallon of the solution makes 64 gallons of cleanser of a greater strength than generally recommended for disinfecting.

Latex Adhesives

Latices bond nylon and rayon to rubber, improve standard latex-type adhesives.

High strength bonds are obtained between rubber and rayon or nylon through the use of two new latices, designated as Hi-Tac 56-M and Hi-Tac 802, developments of The General Tire & Rubber Co., Akron, Ohio.

Both types of Hi-Tac are recommended

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Cowles DRYMET, anhydrous sodium metasilicate, is the most highly concentrated form of sodium metasilicate available. It is more economical to use, on the basis of both Na_2O (alkalinity) and SiO_2 (silicate) than any other type of hydrated or anhydrous detergent silicate, either compounded or by itself. DRYMET contains no water of crystallization.

DRYSEQ*

THE ALL-PURPOSE DETERGENT SILICATE

Cowles DRYSEQ, anhydrous sodium sesquisilicate, is a medium pH alkaline cleaner which will do fast, dependable work at a low cost to the user. It is a white, free-flowing powder, quickly and completely soluble in hot or cold water—containing 56.75% Na_2O—making it an economical base material for compounding.

DRYORTH*

THE HEAVY-DUTY DETERGENT SILICATE

Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anhydrous, free-flowing powdered silicate containing not less than 60% Na_2O, which may also be used as an economical constituent of high pH cleaning compounds.

CRYSTAMET*

THE MEDIUM pH DETERGENT SILICATE

Cowles CRYSTAMET is a pure, perfectly white, free-flowing granular pentahydrate sodium metasilicate with the normal 42% water of crystallization. Suggested for compounding when it is desirable to lower the concentration of a finished product. Readily soluble—chemically stable—easy to handle. Can be used on medium pH jobs.

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The answer is color bodies and other impurities which are not removed from the fatty acids by the usual processes such as distillation and filtration. These impurities not only make the Red Oil red, but they give it the strong odor usually associated with this product. In addition, these impurities make the Red Oil unstable in color when heated in processes such as esterification and saponification.

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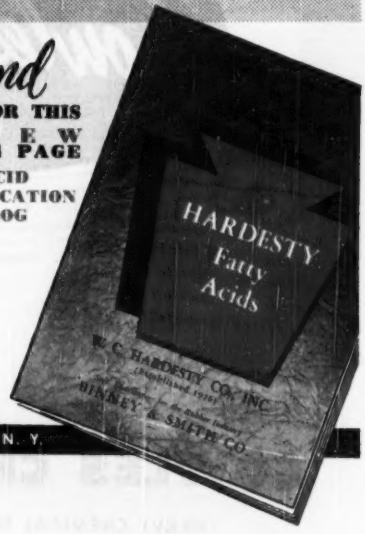

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for treating cord or fabric to be used in the manufacture of tires, belting, hose or other rubber goods involving a fabric-rubber structure. In preparing commercial dips, these latices may be blended with resorcinol-formaldehyde resin solution to obtain high levels of adhesion.

Hi-Tac 56-M is a straight synthetic latex, while Hi-Tac 802 is a specially prepared blend based on Hi-Tac 56-M, and is considerably lower in cost than the 56-M type. Depending on the particular service requirements, Hi-Tac 56-M may be used alone or may be blended with other synthetic or natural rubber latices. Hi-Tac 802 is generally recommended for use alone without further blending except for the customary addition of resorcinol-formaldehyde resin.

In addition to their use in latex dips for rayon and nylon, Hi-Tac can be employed as an additive to improve the adhesive properties of standard latex-type adhesives for a variety of applications. A technical bulletin on the Hi-Tac latices covers their method of use and bonding data on single cord rayon and nylon.

Smudge-Proof Tape

Pressure-sensitive labeling tape resists water, oil, acid, high temperatures.

Labelon, a patented smudge-proof labeling tape, has just been introduced by the Labelon Tape Co., 100 Anderson Ave., Rochester, N. Y. The new pressure sensitive tape is water-proof, oil-proof, acid-resistant and will withstand temperatures up to 150° F. Made of two sheets of acetate tape with a special carbon material sealed between, identification cannot be erased, smudged, or rubbed off.

Packaged in its own dispenser, Labelon is available in 5/8 or 3/4 inch widths with either a blue or black edging. Any desired length is easily torn off. It sells in 500-inch rolls at $1.49 each.

Wood Preserver

Pentachlorophenol concentrate distribuuted through Sears, Robuck.

Monsanto Chemical Co.'s 1-to-10 concentrated pentachlorophenol is now available nationally, with Sears, Roebuck and Co. as its first national distributor. Sears is offering the preparation in its new catalogs and in its retail stores under its own brand-name Master-Mixed. According to Monsanto, the wood preserver and termite repellent is permanent, non-discoloring and paintable. Both home and industrial uses are seen for it.

One gal. of the concentrate may be diluted with recommended oils to yield 11 gal. of a 5% pentachorophenol solution. It may be brushed or sprayed to protect existing structures or employed as a dip for such items as

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fence posts and small-lot construction materials, particularly for ground and near-ground installations. Industrial uses suggested are loading platform, decking, roofing and timber treatments.

The Sears brand of the formulation is available for home use in 1-qt. and 1- and 5-gal. containers, and for industrial use in drums.

Feed Fortifier

Methionine available in feed grade to fortify soybean meal.

A feed grade methionine in a price range that will enable feed manufacturers to use the amino acid in fortifying soybean meal is now available from U. S. Industrial Chemicals, Inc., 60 E. 42nd St., New York 17, N. Y. The feed grade methionine was developed by the company to meet the demands for the amino acid resulting from numerous recent formulation changes in animal feeds, chiefly in the trend toward fortified vegetable proteins in place of animal and fish products in feed. Previously the amino acid has been used in pure form as a pharmaceutical.

In animal feed, methionine speeds growth and reduces mortality in early life, and improves the quality of animals for market. USI's 97% DL-Methionine is a light gray, free-flowing powder. It is being made available in 5, 10, 50 and 100 pound lots.

Soil Fumigant

Fumigant for both greenhouse and outside use offered as experimental product.

MLD, a new soil fumigant for both greenhouse and outside use, has been introduced by Innis, Speiden & Co., 117 Liberty St., New York 6, N. Y. It is said to be particularly effective in killing most nematodes; to give good weed control when properly used; and to control soil-borne diseases where infestation is moderate.

For greenhouse use, MLD is designed particularly for the small grower wanting to make his own application without discomfort and without the expense of a contract application specialist.

It is a dark, oily liquid, slightly lachrymatory and with characteristic odor, and is corrosive to machinery. The liquid is 100% active containing chlorinated C_3 hydrocarbons (including 1,3-dichloropropene, 1,2-dichloropropane, and related chlorinated hydrocarbons) and trichloronitromethane. It is offered as an experimental fumigant, cannot be used around living plants. Application is about one gallon per thousand sq. ft.

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TRADE MARKS OF THE MONTH

From Official Gazette—Vol. 631, Nos. 2-4 (Feb. 14-28) and Vol. 632, Nos. 1-3 (Mar. 7-21).

DI-TICK. Insecticide preparation for ticks and fleas on dogs, cats, horses, sheep, hogs, and cattle. 481,206. Belco Chemical Products Co.

SYN-LUX. Synthetic enamels, varnishes, ready-mixed paints. 496,226. Ellis Paint Co.

TEXTURESIN. Solution of resinous material for coating surfaces to produce ornamental effects. 496,775. Eronel Industries

Tiger. Model gas engine fuel mixture and model gas engine lubricating oil for toy model engines. 501,334. Tiger Products Co.

"PREP". Chemical preparation for cleaning and preparing metal surfaces to receive paint. 504,858. Neilson Chemical Co.

CADORICIN. Shampoos, hair tonics, toilet water for the hair, toilet powder for hair dressing, hair lotions, etc. 510,232. Cadoricin Societe Anonyme

BISSELL. Oil paints in paste or liquid form, paint enamels and varnishes. 515,604. Bissell Varnish Co.

PINE-SOL. Liquid composition for use as a general household cleaner, disinfectant, and deodorant. 516,083. Milner Products Co.

"Kolor-Brij". Paint brush cleaner and preservative. 518,385. Brush-Save, Inc.

KORD Crownette CONCEN-CREME. Shampoo. 519,960. Kord Cosmetic Co.

Dir-Toff. Liquid soap. 520,034. Highley Chemical Co.

Silvern. Synthetic resinous coating materials for preventing silverware tarnish. 520,300. Ramon Products, Inc.

HYDROID. Hydraulic brake fluid. 520,450. Hydroid Chemical Co.

JIM DANDY. Paint enamel, varnish, varnish stain, and ground color for varnish stain. 521,067. New Method Paint Co.

(Symbol) Varnishes, paint enamels, baking enamels, paints in liquid form, primers and sealers. 521,068. Martin Varnish Co.

fish-o-roma. Chemical preparations for treating artificial bait. 521,071. Davadon Labs.

WET-PATCH. Plastic reinforced with long asbestos fibres for use as an emergency stop-leak. 521,073. Paraffine Cos., Inc.

TIZ-KWIK. Penetrating oil for rust. 521,075. Tiz-Kwik Oil Products Co.

HOSPITAL. Enamel paints. 521,326. Jack Nirin Co.

SNYDER CHEMICAL CORPORATION SYNCO RESINS. Synthetic resin compositions particularly molding, casting, and laminating resinous compositions. 521,340. Snyder Chemical Corp.

ANTI-SEEP. Masonry wall coating of paint-like material. 521,344. Williamson Products Corp.

"The Paint Store On Paint Street". Dry, ready-mixed, and paste paints, varnishes, linseed oil, and turpentine. 521,372. Placier's.

WILDROOT SHAMPOO. Shampoo liquid soap. 522,037. Wildroot Co., Inc.

Waterman's INK. Writing ink. 522,045. L. E. Waterman Co.

Waterman's INK. Writing ink. 522,046. L. E. Waterman Co.

SOFDDO. Softening and emulsifying agent for baked goods. 522,052. American Breddo Corp.

BEM BRINGS EXTRA MONEY. Superphospate and mixed grades of commercial fertilizer. 522,074. Thurston Chemical Co.

SUPER SHINE. Shoe polish. 522,075. Charles E. Hartford.

ANTIROT. Wood preservative. 522,076. Woolfolk Chemical Works, Ltd.

Fur-Lastic. Soluble farinaceous mixture which, when dissolved in water is used for treating fur and fur pelts to soften and preserve them. 522,078. Fur-Flex, Inc.

WEEDUST. Chemical preparations for exterminating weeds. 522,846. American Chemical Paint Co.

JOHNSON'S SELBST-GLANZ. Floor polish. 522,854. S. C. Johnson & Son, Inc.

Pretty Package. Soap. 522,861. Harriet Hubbard Ayers, Inc.

FUR-LYF. Composition for softening and stretching leather and fur pieces. 522,862. Bixbee Research Inc.

KANOFAN. Gum arabic. 524,881. John Manguissoglou, Ltd.

(Symbol) Harness oils, belt dressings, metal polish or gloss for cleaning, brightening, or polishing metal-finished surfaces, and for dry cleaning fluids. 525,123. Standard Oil Co.

(Symbol) Polish or gloss for cleaning and polishing automobile bodies and the like, and same for furniture and finished woodwork. 525,156. Standard Oil Co.

Martispar FLOOR & TRIM VARNISH. Varnish. 529,285. Martin Varnish Co.

KLEENAIRE KEMIKILS. Pressed Para-

dichloro benzene cake. 531,217. Kleenaire Kemikils, Inc.

"SWIPE" Soap. 533,978. Beaver Home Products Co., Inc.

DRAWSOL. Special lubricating compound in paste form for drawing and cutting operations. 534,684. D. A. Stuart Oil Co., Ltd.

Valveglide. Lubricating solvents for purging carbon and other foreign material from engine valves. 535,607. Pate Oil Co.

ZIPIZ. Liquid and chemical paint and varnish remover. 537,399. Arrow Products Corp.

Amercoat. Cementitious acid proofing material for lining or coating steel or concrete pipes, structures, tanks, vats, walls, floors, etc. 537,649. American Pipe and Construction Co.

ECO VAR. Lacquers, enamels, and varnishes. 537,925. Maas & Waldstein Co.

DOMINO. Ready mixed paints, paint enamels, varnishes, varnish stains, and roof coating. 540,899. Republic Paint & Varnish Co.

STORM SHIELD. Ready mixed paint, varnishes, and liquid tar-based roof coating. 541,457. Republic Paint & Varnish Co.

O-SO-EZY. Polishes and waxes for furniture, walls, floors, and automobiles. 541,771. O-Cedar Corp.

NITROLOID. Liquid lacquer paint finishes. 544,276. Pittsburgh Plate Glass Co.

AQUASORB. Synthetic plastic material having foam-like structure, capable of absorbing moisture. 546,139. Waterway Projects, Inc.

DETREX. Stripping chemicals for removal of electro deposits from metallic articles; protective coatings for covering paint spray booths etc; chlorinated hydrocarbon solvents; alkalis; rust removers of the organic emulsion type; and rust inhibitors of organic emulsion type. 546,966. Detrex Corp.

HYDROIL. Oil based wall finish paint in paste or powder form. 547,722. French-Wolf Paint Products Corp.

NAIRN. Wax preparations for floor surfaces of all kinds. 548,790. Congoleum-Nairn, Inc.

DAVID BRADLEY. Hydraulic fluid. 550,079. Sears, Roebuck and Co.

VIRGINIA. Sodium hydrosulphite, zinc hydrosulphite and zinc sulphate for many specialty uses. 550,277. Virginia Smelting Co.

VERDOL. Liquid cleanser for kitchen use. 550,430. John Paterson & Co. Ltd.

VETYRISIA. Synthetic perfumes and scents for use in manufacture of perfumery products, soaps and cosmetics. 550,802. Firmenich & Co.

Syntaloid. Liquid pigment for use in paints. 550,986. Eagle-Picher Co.

SAFEGUARD. Various paints. 551,615. Cussins and Fearn Co.

147. Exterior and interior ready-mixed paints, varnishes, and colors in oil. 552,247. Kenney Paint & Varnish Co., Inc.

ACTO. Soluble petroleum sulfonates used as dispersing and wetting agents for coating particles in the nature of paint pigments to facilitate suspension of the pigments. 552,508. Esso Standard Oil Co.

ACTO. White mineral oil petroleum sulfonates for general use, cleaning and wetting agents for adhesives, anti-rust and metal cleaning compounds, pickling agents, splitting agents for fatty oils, fats and greases, dispersing agents for paper ingredients, absorbent agents, sizing agents, flotation agents, wetting and spreading agents, leveling, penetrating and wetting agents for fabrics, plasticizers and lubricants for plastics. 552,513. Esso Standard Oil Co.

MONITOR. Barn and roof paint. 552,732. Eagle-Picher Co.

WINCIDE. Disinfectants, bactericides, surgical disinfectants, and moth sprays. 552,858. Industrial Soap Co.

FRITZBRO AROME. Flavoring extracts for food. 553,610. Fritzsche Brothers, Inc.

A-K. Boiler fluid for treating water to be used in marine boilers. 554,021. Goddard & Co.

(Symbol) Artists' supplies—namely, highlight white and wash black paints used in preparing art work for production. 554,126. Kemart Corp.

PIN-O-SOL. Liquid composition used for disinfecting, as a solvent in cleaning and for removing obnoxious odor and substituting a pleasing odor. 554,525. Southern California Disinfecting Co.

formula 369. Wet, waterproofing paint, in ready mixed form, to be applied to masonry. 556,068. Arid-Crete Corp.

P-D-S. Food ingredients of high protein content for use by humans, animals, and birds. 556,101. Interchemical Corp.

Worthmore. House paint etc., and aluminum paint. 557,374. Mutual Dealers Wholesale Inc.

MONSANTO. Synthetic resins in solid form for general use in the industrial arts. 557,548. Monsanto Chemical Co.

ALGO. Chemical composition used for the preparation of natural and synthetic amino acids. 557,715. Algo Chemical Co.

MIL-DONT. Preparation to be mixed with water and applied to surfaces to prevent formation or growth of mildew or other fungus organisms. 557,873. Chemspecs Lab.

(Symbol) Preparations used in treatment of animal diseases. 557,985. Dr. L. D. Le Gear Medicine Co.

(Symbol) Bowling alleys lacquers and related products. 559,001. Brunswick-Balke-Collender Co.

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NEW PRODUCTS & PROCESSES

Molds for Casting by New Resin-Sand Process

High-precision castings and 90% saving of sand obtained by new mold-making process.

A new process for producing foundry molds and cores combines the advantages of increased production, reduced cost, and improved quality of the casting.

The new foundry method is known as the Croning Process, for which Crown Casting Associates, 75 Federal St., Boston, Mass., own and control United States and Canadian patent applications.

Advantages of the Croning Process: The castings require little or no finishing such as sand blasting or wheel abrading; tolerances of .002 to .003 of an inch per inch can be common practice; and greatly increased productivity of the floor space is obtained.

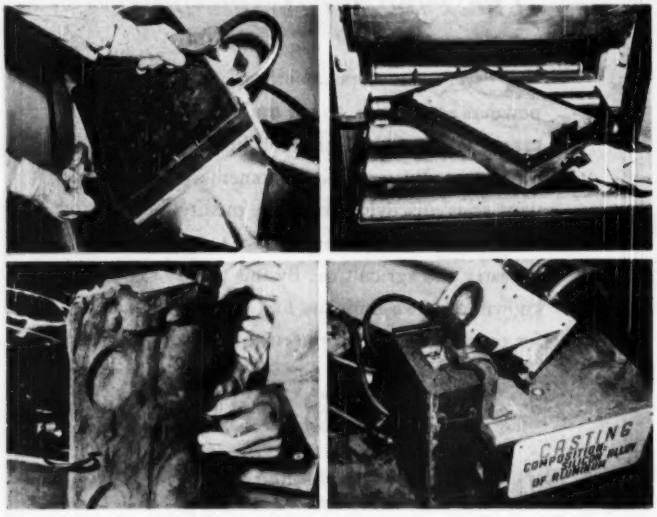
A saving of up to 90 per cent in the amount of sand required is realized, for the new molds are thin shells bonded with Bakelite resins as contrasted with the heavy, cumbersome sand mold. Long baking and curing is not required.

Cores are made in the same manner as molds (*see cut*) except that the resin-sand mixture is blown into a hot split metal core box by means of compressed air. The excess material falls out when the flow of air is stopped. The cores are, therefore, hollow and have the same wall thickness as the molds.

Since the cores and molds have no affinity for water and have no volatile contents, they can be stored indefinitely until needed.

The liquid metal is poured into the mold in the usual manner. The hot metal on coming in contact with the mold and cores is formed to the desired shape and surface finish. Gases generated pass readily through the mold shell, since the mold has very high gas permeability. The mold and core offer very little resistance to the casting as it solidifies and contracts, minimizing the formation of cracks or hot tears.

The cores and mold can be removed by lightly tapping the casting.



***The hot metal pattern is attached to the mold machine* (upper left). *The mold machine is then inverted and a thin layer of resin-sand mixture adheres to the pattern. The pattern is placed in an oven* (upper right) *until the resin-sand mixture hardens and can then be removed from the pattern. Two half molds are clamped together* (lower left) *and, with the gate vertical, the molten metal is poured* (lower right).**

Dicyclopentenyl Alcohol

Derivatives of a new unsaturated secondary alcohol are interesting as coating materials and plasticizers.

Pilot-plant quantities of dicyclopentenyl alcohol, an unsaturated secondary alcohol obtained by hydration of dicyclopentadiene, are available from the Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.

This C_{10} alcohol has a boiling point of 239-241° C. at 773 mm. (without decomposition), a flash point of 426° F., and an iodine number of 169. It is insoluble in water, and miscible in all proportions with nearly all the common organic solvents.

Derivatives of dicyclopentenyl alcohol, such as dicyclopentenyl linoleate and allyl dicyclopentenyl maleate, have interesting air-drying and polymerizing properties, indicating potential uses in the coatings field. In general, the dicyclopentenyl group contributes toughness and hardness with an improvement in water and alkali resistance. Other derivatives of dicyclopentenyl alcohol which might be interesting as raw materials for coating vehicles include di-(dicyclopentenyl) adipate or maleate, and vinyl dicyclopentenyl ether.

Dicyclopentenyl acrylate and methacrylate are interesting monomers which copolymerize with a wide variety of other monomeric materials and impart air-drying or heat curing properties to the copolymers.

In addition to the preparation of esters and a vinyl ether, dicyclopentenyl alcohol may be oxidized to a ketone, hydrogenated to the saturated alcohol, dimerized to a C_{20} alcohol, and made to undergo all the normal reactions of a secondary alcohol such as oxidation to a ketone, cyanoethylation, reaction with ethylene oxide, and formation of acetals. Chlorine may be added to the double bond and the hydroxyl converted to a chloride.

Amine Derivatives

Series of substituted propylamines should be useful as intermediates.

The American Cyanamid Co. has added the following substituted propylamines to its list of new experimental chemicals: 3-dimethylaminopropylamine, 3-isopropylaminopropylamine, 3-methoxypropylamine, and 3-isopropoxypropylamine. These four volatile amines are soluble in most organic solvents and miscible with water to give solutions with a pH around 12.

The chemical and physical properties of these amines indicate their possible use in the synthesis of emulsifying agents, germicides, and pharmaceuticals. The data describing these properties are compiled in the recently published New Product Bulletin No. 13. Copies may be obtained by addressing the New Product Development Department, American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

Soluble Vinyl

Vinyl-vinylidene chloride resin dissolves directly in solvents, is useful in coatings.

A new, soluble vinyl resin offering economies in the field of solution-applied coatings is now offered by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio. Designated Geon 200 X 20, the product is a vinyl-vinylidene chloride copolymer unique among commercial vinyl

How PURE do you want your H_3PO_4?

DESCRIPTION

Chemical formula: H_3PO_4
Specific gravity: 1.692 (20°C/4°C)
Freezing point: 21°C (70°F)
Viscosity relative to water at 25°C (77°F): 43.5
Turbidity: none

CONTAINERS

Stainless steel drums:
55 gal.—750 lbs. net.
ICC carboys:
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6½ gal.—90 lbs. net.
5 gal.—70 lbs. net.

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V-C Phosphoric Acid, N.F. Grade, is produced in the most modern plant of its kind, on the site of the first phosphate mine and phosphoric acid plant in the U. S.

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resins because of its solubility directly in toluene, xylene, and high-aromatic naphthas.

Solutions ranging up to 50% total solids content can be prepared readily with Geon 200 X 20 by slow addition of the resin to a solvent at ambient temperatures with rapid mechanical agitation. Possessing excellent stability, even high-solids solutions may be cooled to 0° C. and, upon rewarming to normal room temperature, recover original viscosities with no gelling.

Films made from Geon 200 X 20 adhere well to a variety of surfaces including aluminum, copper, lead, tin plate and steel if baked adequately. Films cast from Geon 200 X 20 solutions possess sufficient flexibility for most applications for which the resin is intended and can be plasticized for additional flexibility where necessary.

The new product lends itself readily to application by any of the conventional techniques. Solutions may be brushed, sprayed, roller coated, or—in the higher viscosity ranges—knife or bar coated.

Coating applications for Geon resin 200 X 20 appear to be most numerous at present. Excellent chemical and water resistance, coupled with solubility in inexpensive solvents and easy pigmentation, are some of the primary qualities of the resin recommending it for use in the paint and lacquer industry. The new resin has also shown promise as a film-forming base in printing ink formulations.

Synthetic Waxes, Shellac Substitute

Four new products are designed for manufacture of polishes.

Three new synthetic waxes and a synthetic shellac substitute have been introduced to wax polish manufacturers by Cornelius Products Co. and its affiliate, General Wax Refining Co.

The waxes comprised two additions to the Emulsowax line, Nos. 1742 and 1760, used for the production of water-emulsion wax polishes, and a new wax which acts as a base for automobile and floor paste polishes.

When blended in equal proportions with carnauba wax, Emulsowax 1742 produces a light-colored, finely dispersed, exceptionally glossy emulsion which is stable in concentrates up to 24% solids and can withstand repeated freezings without thickening or jelling. Emulsowax 1742 has a melting point of 176/178° F., penetration of 0-½, acid value of 41-44 and saponification value of 80-84.

Emulsowax 1760 is a low-priced wax with a melting point of 178/180° F., penetration of 1-1½, acid value of 28-30, and saponification value of 80-84. It does not require any additional carnauba or other waxes.

Recommended for use with both of these waxes is the shellac substitute, Nylac, a synthetic resin which improves the spreading qualities of the finished emulsions.

The base for paste polishes is Wax 1822, which is a light-colored wax with excellent oil retention qualities. It has a melting point of 199/201° F., penetration of 3-4, acid value of 11-13 and saponification value of 60-62. Pastes made with Wax 1822 are low in cost, have a hard, smooth, glossy surface and do not bleed or shrink.

Tested formulas for the use of these products are available from the main office of Cornelius Products Co. at 386 Fourth Ave., New York 16, N. Y., or from its Midwest branch office at 14 East Jackson Blvd., Chicago 4, Ill. Manufacturers of polishes will also receive working samples on request.

Fast-Cure Phenolics

New series of general-purpose phenolics allow higher production through faster cure.

A whole new class of phenolic plastics produced by Bakelite Division, Union Carbide and Carbon Corp., 122 East 42nd St., New York 17, N. Y., and designated as C-22 general-purpose phenolic molding materials will provide molders with production increases ranging from 45% to more than 100%. These new phenolics, with curing rates 15 to 45% faster than those of phenolics previously regarded as fast-curing, also offer high gloss and excellent mold release.

The valuable economic advantages provided by these new phenolics include increased output of molded parts, reduced cure time, reduced total cycle time, reduced mold costs, and fewer mold cavities required for a given rate of production.

Three such materials, all suitable for compression and plunger molding in positive or semi-positive molds, are currently available: BM-18750 Black—a general-purpose non-bleedproof molding material offered in the flow range 50-120; BM-18752 Brown—a general-purpose bleedproof brown material offered in the flow range 50-130; BM-18751 Black—a general-purpose bleedproof material offered in the flow range 50-130. To determine various flow ranges, flow was taken at 700 psi.

Dipropionitriles

Experimental dipropionitriles are characterized by unusual solvent selectivity.

Three dipropionitriles have recently been made available by the American Cyanamid Co. They are β,β′-oxydipropionitrile, β,β′-thiodipropionitrile and β,β′-iminodipropionitrile. These compounds, although excellent solvents for most organic compounds, are immiscible with aliphatic hydrocarbons and possess an unusual selectivity for aromatic compounds.

The selectivity is demonstrated by the extraction of benzene of better than 90

BENZOPHENONE (diphenyl ketone) is an intriguing intermediate with an active carbonyl group connecting two phenyl groups—Its use in perfumes is well known but its potential in synthesis may still be exploited. It has been suggested as an intermediate for certain antihistaminics, hypnotics and other pharmaceuticals; insecticides; dielectric media; and as a gas absorbing medium.

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$C_6H_5\ CO\ C_6H_5$

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benzophenone

KAY-FRIES SPECIFICATIONS . . .

melting point	• 46.5°—48.5°C.
molten color	• below 100 Hazen Scale
odor	• characteristic (rose-geranium type)

• Typical reactions of BENZOPHENONE •

$RCH_2MgX + C_6H_5COC_6H_5 \xrightarrow{H_2O} (C_6H_5)_2C(OH)CH_2R + MgX(OH)$

Grignard compound → Substituted benzhydrol

$XCRHCOOC_2H_5 + H_2 + C_6H_5COC_6H_5 \xrightarrow{\text{catalyst}} (C_6H_5)_2C(OH)CRHCOOC_2H_5 + HX$

Subst. haloacid ester → ethyl 3-hydroxy-3, 3-diphenyl-2-subst. propionate

$H_2 + C_6H_5COC_6H_5 \xrightarrow{\text{catalyst}} (C_6H_5)_2CHOH$

benzhydrol

In the reduction, other products may be obtained by varying the conditions.

$H_2O_2 + C_6H_5COC_6H_5 \longrightarrow C_6H_5COOC_6H_5 + H_2O$

hydrogen peroxide → phenyl benzoate

$CO_2 + H_2 + C_6H_5COC_6H_5 \xrightarrow{Na} (C_6H_5)_2C(OH)COOH$

benzilic acid

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per cent purity from a mixture with heptane. Such separations as that of monomethylaniline from dimethylaniline, extremely difficult by other methods, may be successfully carried out using any of these three compounds.

It is suggested that the use of these solvents be investigated for the purification of hydrocarbons and the refining of tall oil, vegetable oils and wood rosins. A copy of the technical bulletin describing these compounds and experimental samples may be obtained from the New Product Development Department, American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

Abrasive-Bonding Resins

Three new phenolic resins, one powdered, two liquid, designed for coated abrasives.

Three new phenolic resins, specially prepared for the coated abrasives industry, have been announced by the Borden Company's Chemical Division, 350 Madison Ave., New York 17, N. Y. One is a unique dustless powdered resin, while the other two are liquid.

The dustless powdered resin, known as "Durite 3308" can be stored indefinitely without the refrigeration required by liquid resins used as bonding agents. Furthermore, it can be prepared in batch quantities at the time of use, and has the properties of being fast air-drying and quick curing at low temperatures.

To complete the range, Borden's is introducing "Durite 3260" and "Durite 3290," the new liquid resins. Designed for conventional manufacturing facilities, the former has normal air curing and drying characteristics, while the latter is somewhat faster in both respects.

UV-Screening Compounds

Furfuralazine and cinnamalazine absorb ultra-violet, transmit visible light.

Two highly efficient ultra-violet absorbing chemicals are being offered for the first time by Pilot Chemicals, Inc., 47 Felton St., Waltham 54, Mass. These are furfuralazine and cinnamalazine. They are characterized by very intense absorption in the ultra-violet and by a sharp cut-off at the boundary between visible and ultra-violet light.

A film 0.001" thick containing one per cent of cinnamalazine will filter out 99 per cent of the ultra-violet radiation between 300 mμ and 390 mμ. In a transparent film of the above mentioned concentration and thickness, transmission of visible light is substantially complete at 440 mμ. Furfuralazine, while not quite so efficient as cinnamalazine, is also an excellent ultra-violet absorber. It has the advantage of being essentially colorless in these concentrations.

Use of these azines is indicated wherever a material is exposed to direct sunlight with resultant deterioration. Some possible uses are in outside paints, in plastics and laminated glass for protecting window displays, protective waxes for cars or outdoor furniture, in plastic or lacquer coating for outdoor furniture, in dye solutions for drapes and carpets, for protecting canvas awnings, sails, convertible car tops, for stabilization of cellulose esters.

Perlite Ore

High-purity perlite ore from New Mexico can be processed to specifications.

High grade perlite ore is now available. Great Lakes Carbon Corp., 18 E. 48th St., New York 17, N. Y., reports that volcanic perlite ore, prepared for furnacing to any specification is now available from the company's deposit at Socorro, New Mexico.

Over the last six months, extensive facilities, including equipment for milling, screening, classifying and drying, have been installed to make this service possible. Large storage bins which will carry stocks of prepared ore also in various sizes have been provided.

Great Lakes Socorro ore is famous for its exceptional uniformity, freedom from impurities and unique popping characteristics. These properties, plus exacting preparation of the ore, assure processors of worthwhile savings.

Great Lakes Carbon Corp., one of the major processors of perlite in the United States, claim that the Socorro deposit is one of the largest and purest known to exist in the United States.

Colorable Styrene

Styrene formulation especially designed for easy application of dry colors.

Color blending of crystal styrene is said to be rendered more efficient and economical by means of a new process of dry coloring developed by Monsanto Chemical Co., St. Louis 4, Mo. The new system of dry coloring crystal styrene eliminates expensive intermediate steps.

Key to the new method is a tiny, rough-cut crystal styrene granule that Monsanto has classified as "colorant blend."

With the new blend, colors no longer have the objectionable mottles or streaks generally encountered in dry coloring. Highly satisfactory results may be obtained at a cost lower than by any other method and with substantial savings to the molder. Cost of coloring is less than two cents a pound.

Formulations for 12 basic brilliant colors are available in the new colorant blend. They include transparent, translucent and metallic colors.

Simple tumbling equipment, and a barrel for each color desired, is rec-

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Now, every chemist can prove to himself why Baker & Adamson Quantitative Filter Papers are so superior for careful analytical work. To laboratories not yet familiar with the advantages of these quality products, B&A offers free trial packets. Try them; see for yourself the high speed, high retention, and high strength these dependable filter papers offer. You'll be favorably pleased with the results. For your test samples, fill in and mail coupon *promptly*—this offer is limited.

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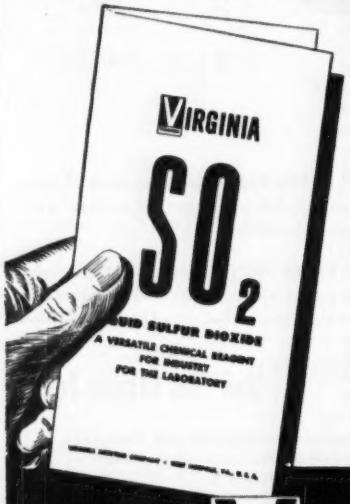
Magnesium is fine for flares. It is also an ideal metal for building aircraft and for machine parts, where light weight is essential. To form these, molten magnesium must be die-cast into intricate forms and heat treated under conditions which make it highly combustible.

During the war, "Virginia" engineered a method of preventing the magnesium from igniting during this ticklish process. "Virginia" Liquid Sulfur Dioxide (SO_2) was injected into the molds and into the magnesium furnaces as a reducing agent. Costly fires were prevented.

For 29 years, "Virginia" has researched and developed special applications for its SO_2 in over 40 different industries. Its varied properties are used as a reducing, neutralizing, and bleaching agent, preservative, antichlor, and pH control. "Virginia's" technical knowledge and its unparalleled plant and storage facilities make it the world's outstanding manufacturer of SO_2.



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VIRGINIA Chemicals

ommended for the new process. Colorant blend crystals and dyestuff are tumbled from 10 to 30 minutes, then emptied into bins or tote-barrels for feeding to the press.

Intermediate compounding is unnecessary with the new method, as are large inventories of crystals of various colors. Molders need stock only the colorant blend crystal and the dyestuffs they need.

Foundry Resin

Casting economies claimed for use of phenolic sand core binder.

A synthetic thermosetting resin especially designed for use as a core sand binder has been developed by Monsanto Chemical Co., St. Louis 4, Mo. It is an efficient, rapid-curing phenolic of high bond strength and low cost.

Superior castings as well as lower core sand costs are claimed possible when Resinox 4846 is substituted for more conventional core bindings. Better surface finish, cleaner castings, greater detail, less tendency toward veining, scabbing, spalling, blows and hot tears have been demonstrated.

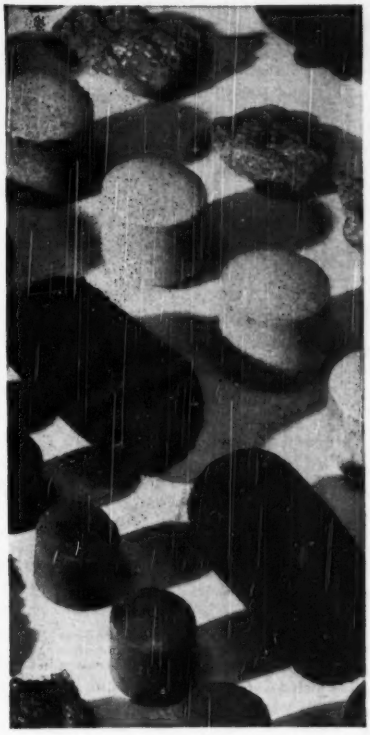
Savings may be anticipated from higher sand to resin ratios, reduced fuel consumption during baking, increased core-making capacity and less breakage of stored cores.

• In order to satisfy requirements for a **cozymase** product of higher purity than was commercially available, Schwarz Laboratories now offers, in addition to its 60 per cent cozymase, a product of 75 per cent level of purity. Prices and further information on purified cozymase may be obtained directly from Schwarz Laboratories, Inc., 202 East 44th St., New York 17, N. Y.

• Another **cozymase** material is now being prepared by the Sigma Chemical Company, 4648 Easton Ave., St. Louis 13, Mo., with a guaranteed purity of approximately 90%. Where this unusual purity is not required, Sigma Chemical Co. is also offering a lower-priced preparation which assays approximately 65% to 70% pure.

• With good grades of **Oil Ylang Ylang** virtually impossible to obtain today, Fritzsche Brothers, Inc., New York, has succeeded in developing a synthetic replacement for the natural Ylang composed entirely of readily available constituents and, therefore, independent of imported raw materials. The new product, identified as Basicol Ylang Extra, duplicates very accurately not only the basic odor of the natural oil but its characteristic topnotes as well.

HARSHAW MANUFACTURES PREFORMED CATALYSTS TO FIT SPECIAL PROCESS REQUIREMENTS • • •



Our experienced technical staff will assist you in developing the best and most economical catalyst

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Boron Fluoride Addition Compounds		Hydrofluoric Acid Anhydrous
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Chrome Alumina	Cobalt	Nickel
Molybdena Alumina	Copper	Vanadium

★ Experience has proved that economies can be realized by having Harshaw manufacture catalysts to specifications. If you have a catalytic process in the development or production stage, a discussion with us may prove beneficial.

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NEW EQUIPMENT

Classifier

Dorr Co. has developed a new combined mechanical and hydraulic classifier.

The new Hydroscillator of the Dorr Co., Barry Place, Stamford, Conn., involves the principle of inducing mechanical mobility of settled oversize. The term, "Hydroscillator," comes from the fact that this essential mobility is attained by a combination of upward-flowing hydraulic water and oscillation.

The Hydroscillator consists of a shallow, cylindrical oscillating classifying compartment and, directly below, a reciprocating rake dewatering compartment. A vertical motor drive unit imparts to the cylindrical oscillation compartment rapid circumferential oscillation about a vertical axis. Feed enters through a radial trough or launder. Water under pressure passes into the bottom of the classifying compartment through closely-spaced perforations in an oscillating contriction plate. Thus, a "teeter bed" is set up with particles ranging vertically from fines, close to the separation mesh at the top, to very coarse granular particles at the bottom. Fine particles at the top of the "teeter bed" are swept outward by radial flow of hydraulic water, and overflow across a peripheral weir.

Coarse, oversize particles work to the bottom of the "teeter bed," flow to the periphery of the classifying compartment, pass under a stationary side wall and over an oscillating lip into the reciprocating rake compartment. The oscillating effect maintains fluid mobility in this seal. These coarse particles settle rapidly through the water in this lower compartment, are picked up by the reciprocating rakes and advanced up the steeply inclined slope for discharge. Due to cleanliness of this oversize product and absence of lubricating slimes, there is virtually no slip-back on the inclined drainage deck.

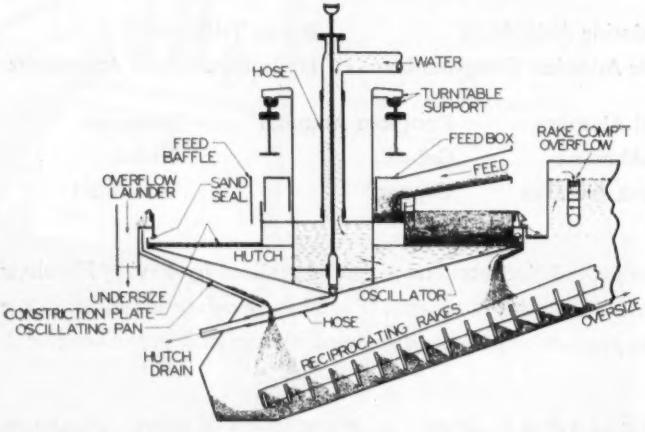
Where the oversize particles rise in the annulus between the stationary side wall and the oscillating lip under the head imposed by the bed of teetering solids, they meet and overcome a back pressure set up by the head of water in the reciprocating rake compartment, where the water level is maintained above the pulp level in the oscillating compartment. This results in a "U" tube effect or hydraulic balance. An adjustable overflow in the reciprocating rake compartment may be manipulated upwards and downwards to control the pressure exerted at this point. This, in turn, controls conditions in the oscillating compartment and consequently the fineness at which separation is made.

The Hydroscillator is more expensive than standard types of mechanical classifiers and costs slightly more to operate. Thus its use is justified only where there is a definite advantage in producing cleaner-than-normal rake products, and in making closer-than-normal separations.

Pump Protector

New unit prevents damage to pumps from running without water.

Protectrol, manufactured by Automatic Control Co., 1005 University Ave., St. Paul, Minn., automatically stops a pump until manually reset in case water is not discharged when the pump is placed in operation. Both an audible alarm and a light warning light are used. The new control can be used independently or with other controls.



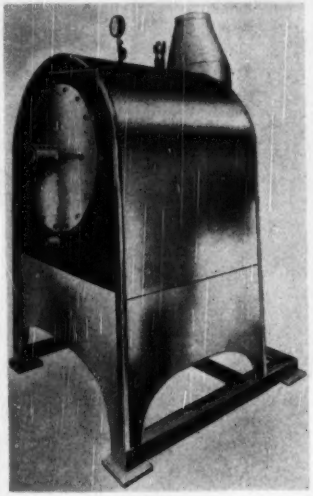
THE DORRCO HYDROSCILLATOR-SECTION

Evaporator

"Stabilizer" to be used for continuous non-fouling evaporation.

Bowen Engineering, Inc., North Branch, N. J., has added a new piece of equipment, the "Stabilizer." The Stabilizer is used for continuous non-fouling evaporation, for continuous rapid concentration of thin solutions of heat-sensitive materials and for bringing concentrated syrups to higher degrees of concentration.

The body of the Stabilizer is a code-welded insulated steel jacket. The inner



wall is a horizontal cylinder against which a rotor arm is carried on a centrally located shaft, driven at low speed. Operating steam pressure may be from 75-100 psig.

Thin material is delivered through a feed pipe at one end of the cylinder and a discharge pipe removes the concentrate at the opposite end, while evaporated vapor leaves through a stack. The patented rotor forces the liquid to present a very large surface area for heating and vapor release. The short treatment time, a matter of minutes, permits retention without damage, of the heat-sensitive components of materials being handled.

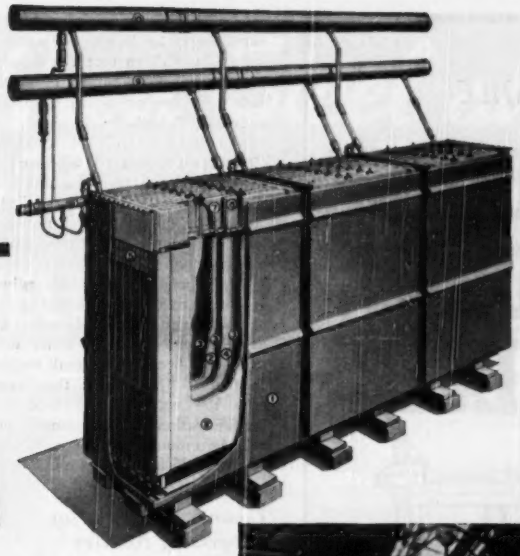
The Stabilizer is available in six sizes with an evaporation rate from 600 to 12,000 pounds per hour. Can be had in mild or copper-bearing steel, or stainless steel, at all liquid contacts.

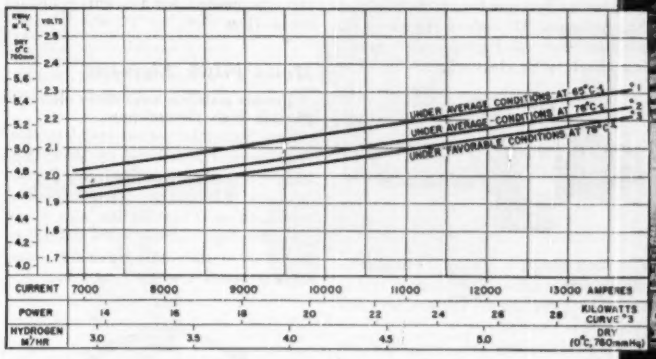
Humidifier

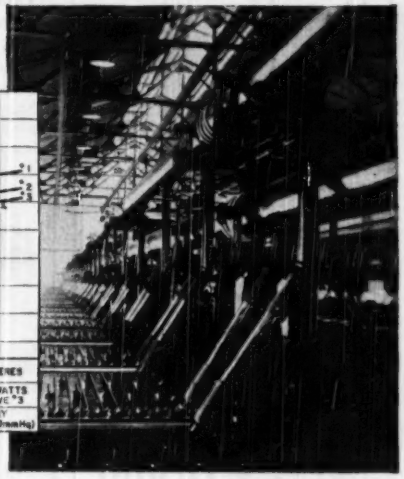
High pressure nozzles break up water for humidification.

Daffin Mfg. Co., Lancaster, Pa., has developed a new heavy-duty high capacity humidifier.

CHEMICO
can now supply
HYDROGEN-OXYGEN CELLS
AT LOW COST







Note these important advantages:

1. **Low initial cost—low maintenance cost.**
2. **Diaphragms held rigidly in frames to prevent flapping thus greatly increasing the life of the material.**
3. **Cathodes readily removable for easy cleaning without disturbing remaining components of cell.**
4. **Interchangeable parts simplify maintenance.**
5. **Low power consumption.**
6. **Compact design—requires less floor space.**
7. **Fully automatic operation.**
8. **Single connectors between cells simplify dismantling and assembly.**
9. **Safety design virtually eliminates explosion hazard.**

These outstanding results are achieved by standardization of an advanced type of cell built to one unit size of 10,000-ampere loading. These cells can be operated at any power loading up to rated capacity. In fact, operations below rated capacities result in important power economies. Installations are practical at rates as low as 500 cu ft per hr.

Chemico hydrogen-oxygen electrolytic cells are available for immediate delivery. Write for quotations, stating your conditions and requirements.

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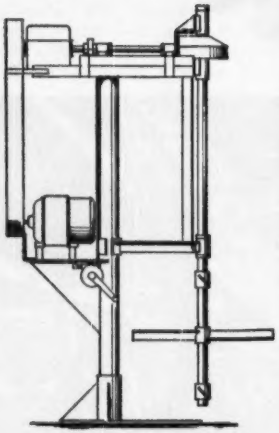

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"Equipment for YOUR Plant"

The Hum-O-Zone uses a high pressure pump to break up water with special nozzles so that the droplets of water are acceptable to the air. The new unit measures 22″ deep by 26″ wide by 42″ high.

The Hum-O-Zone is divided into chambers and water is atomized in the upper portion of the machine and syphoned into the air stream, 750 cfm. Syphoning eliminates the necessity of using the conventional-type baffle arrangement.

The Hum-O-Zone is fully adjustable. It is a complete packaged unit and operates with only a cold water supply and 110 volt AC. No water drain is necessary because the tank capacity is controlled by a float; thus pumping only the water to be used for air humidification. The automatic control may be mounted on the wall within a radius of 25 feet of the unit.

Clean-out Needle for Atomizing Nozzles

Pneumatic atomizing nozzle with clean-out needle speeds clog removal.

Spraying Systems Co., 3201 Randolph St., Bellwood, Ill., solves the clean-out problem with ¼ J pneumatic atomizing nozzle with clean-out needle. The

clean-out needle is a part of the assembly and by pushing the plunger end at the rear of the nozzle, the entire orifice passage is cleaned.

Normal position of the clean-out needle is open under spring loading and will return to this open position whenever the plunger is released. The assembly is available in brass, stainless steel, and monel metal. Nozzle assemblies can be supplied in all standard Spraying Systems pneumatic atomizing nozzle set-ups.

Temperature Control

New automatic control holds temperatures within 0.5°F.

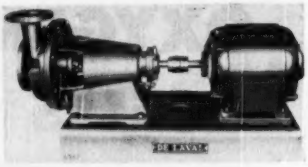
The new control unit, Pakotemp, of Pako Corp., 1010 Lyndale Ave., N., Minneapolis, Minn., provides temperature control by circulation of a tempering fluid rapidly through a jacket surrounding the critical fluid. A new type stainless steel heat exchanger automatically provides heat or refrigeration as required for control. Use of a closed circuit eliminates the expense and necessity of providing a constant water supply.

Pakotemp is self-contained and requires only one electrical and two noncorrosive plumbing connections.

Centrifugal Pumps

The new Type CP pumps provide versatility by easy change from open to closed impeller.

Type CP pumps of De Laval Steam Turbine Co., Trenton 2, N. J., designed for general service, are furnished with interchangeable open or closed impellers, mechanical seals or conven-



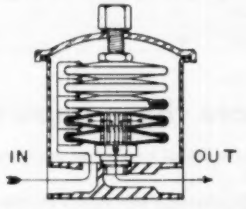
tional packing, and with vane characteristics and materials of construction to suit.

Parts are standardized so that only two sizes of shafts, shaft locknuts, bearings, bearing cartridges, and pedestals are needed for the entire line of seven sizes.

Metal Filter Element

Porous stainless steel filter elements provide high throughputs.

New Surfamax porous stainless steel filter elements, marketed by Micro Metallic Corp., 193 Bradford St., Brooklyn 7, N. Y., have the general shape of an accordion. They are available in six pore openings ranging from 0.0002″ to 0.0065″. For simplified servicing, a single nut opens the filter container and



the filter element removed in a matter of seconds.

Standard units with pipe connections from ¼″ to 2″ are available. Units can be supplied on special orders up to 10″ pipe size to handle 10,000 gpm.

• Manzel Div. of Frontier Industries, Inc., 224 Babcock St., Buffalo 10, N. Y., announces a new large capacity **chemical feeder.** Capable of pumping against 300 psi per feed, it is adjustable up to one gpm per feed.

Multiple units may be supplied with any number of feeds, operated by rotary, motor, or lever drive. Pumping units may be constructed of various

Bronze, Iron, Steel and Corrosion-Resisting Valves-

POWELL MAKES THEM ALL!

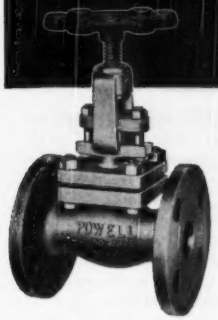


Fig. 1979-NI — 150-pound Nickel O. S. & Y. Globe Valve. These valves, in sizes 1½" and smaller, have been modified and are now available with face-to-face dimension conforming to MSS SP-42 Standard. Sizes 2" and larger conform to A. S. A. B16.10 Standard.

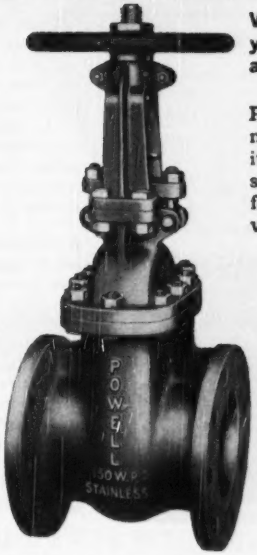


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

When you come to ONE SOURCE, you simplify your valve buying—and stocking of spare valves and parts—for your entire flow control system.

Powell Bronze, Iron, and Steel Valves are second to none in giving long, trouble-free service. And when it comes to Special Design and Alloy Valves for Corrosion Resistance, Powell is the acknowledged leader. In fact, Powell makes the *only* COMPLETE line of these valves available to Industry today.

Fig. 1708 — 200-pound Bronze Globe Valve with union bonnet, renewable, specially heat-treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

Fig. 1828 — 200-pound Monel Metal Gate Valve with screwed-in bonnet, screwed ends and inside screw rising stem.

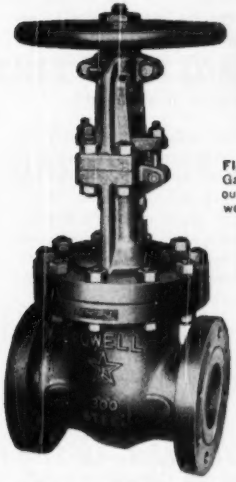


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 2433 — 150 - pound Bronze Regrinding Swing Check Valve. Flanged ends and bolted flanged cap. Disc has ample lift to permit full, straightway, unobstructed flow through the valve body.

The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

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The Wm. Powell Co., Cincinnati 22, Ohio

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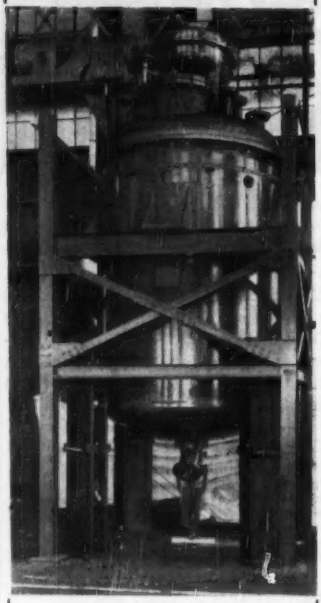

2750-Gal. BUFLOVAK-DOPP Grease Kettle

Investigate these BUFLOVAK Features for your processing problems:

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- **Easy and rapid discharge of material.**
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- **Sturdy construction — dependable operation — low maintenance cost.**
- **Built in sizes from 1-gal. laboratory units to largest plant size kettle.**
- **Facilities available for pretesting operation.**

Write for complete information.

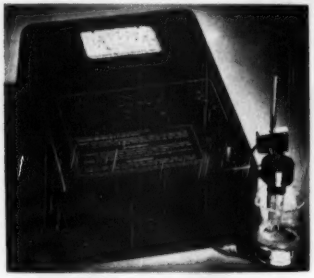
BUFLOVAK EQUIPMENT DIVISION
of Blaw-Knox Company
1579 Fillmore Ave., Buffalo 1, N. Y.

special materials. Only the pumping unit contacts the chemical, as the entire driving mechanism operates in a tightly enclosed oil-filled case.

• A new line of **mercury manometer flow meters** is available from Fischer & Porter Co. These flow meters require no pressure-tight bearings or stuffing boxes: they use the F&P magnetic clutch, or the F&P impedance bridge electric transmitter.

The new units are available in several models: close-coupled magnetic clutch, with or without pneumatic transmission to a remote location—electric impedance bridge transmitter when it is desired to transmit to a distant exhibiting instrument—automatic control of the ratio of flow rate of two fluids, and others. Furnished with 35", 50", 100", 200" and 400" water column equivalent range tubes, the meters withstand 1500 psig in cast steel construction.

• Coleman Instruments, Inc., Maywood, Ill., announces its new Model 30 AC line-operated **pH meter.** Designed

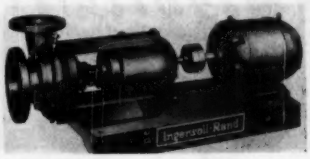


for operation at 95-130 volts, 50/60 cycles, this new instrument is characterized by high stability and almost complete freedom from drift. Accuracy and reproducibility to within 0.05 pH. Continuous, direct reading in pH or Millivolts. Polarizing current available for Karl Fischer Titrations.

• Stainless steel construction, making it particularly adapted to precise laboratory work which permits no contamination, has been incorporated in the new Model MS "midget" processing **mill,** made by Morehouse Industries, 1156 San Fernando Rd., Los Angeles, Cal. Equipped with a 3 or 5 HP motor, Model MS has a capacity of 8 to 20 gph, depending upon the viscosity of the material processed. Diameter of the mill is 14" and height is slightly more than 3' including filling funnel.

• The Brooks Rotameter Co., Box B-15550, Lansdale, Pa., has developed a compact, portable **flowmeter** kit with a wide float range for research, pilot plant and field work. The kit has three integral metering tubes with two special floats for each tube made of pyrex and tantalum. The flow range of this meter is 0.1 cc/min. to 0.5 gpm of liquid and 5 cc/min. to 2 cfm of air.

• Ingersoll-Rand Co., Phillipsburg, N. J. has introduced a new line of cradle-mounted **centrifugal pumps.** The pumps



are built in 5 different sizes, single and two stage. Sizes range from ¾" to 5" discharge with capacities up to 1600 gpm and heads up to 250 feet. Normal horsepower range is from ¼ to 75.

The pumps may be driven by direct electric motor, electric motor and V-belt, turbine through reduction gears, direct turbine, V-belt gasoline engine or direct gasoline engine.

• Reduced prices for a new standard line of **accessories for photoelectric relays,** consisting of a complete range of improved light sources and phototube holders, has been announced by General Electric Co., Schenectady, N. Y.

• Eriez Manufacturing Company, Erie, Pa., has redesigned its line of permanent **magnetic pulleys** to provide increased magnetic power, lighter weight and greater structural strength. In some models the magnetic pull has been increased as much as 50%.

• A miniature **radiation pyrometer** for measuring temperatures of targets as small as ½" dia. at short distances has been developed by the Brown industrial division of Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa. The new device is for use where space is limited and temperature ranges from 200 to 2500 deg. F.

• A new all-steel 21" single-disc **aspirator** made by Sprout, Waldron & Co., Inc., Muncy, Pa., separates light from heavy solids. Gravity-fed product drops through an adjustable feed sleeve onto a 21" saucer-like cast iron disc which revolves at an adjustable speed of 98 to 160 rpm. Separation is performed by an air stream.

• The Wheelco Instruments Co., Chicago 7, Ill., has developed a compact new **indicating pyrometer,** Model 192 for flush and surface mounting. It is designed for those applications where size and space are limited. Front dimensions are 7½" wide and 5" high. The high resistance "edgewise" movement with Alnico V magnet and wide open mirrored scale is

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THEY'RE ALWAYS UNIFORM! You'll find every Hackney Acid Drum uniform in size, weight, strength and capacity. And no wonder! Only superior materials are used, after they are properly analyzed by expert metallurgists. Rigid inspections are made after every stage of production.

THEY'RE EASY TO CLEAN! No dirt or foreign matter can contaminate your product, for Hackney Drums are easy to clean. Interiors are smooth, entirely free of cracks and crevices.

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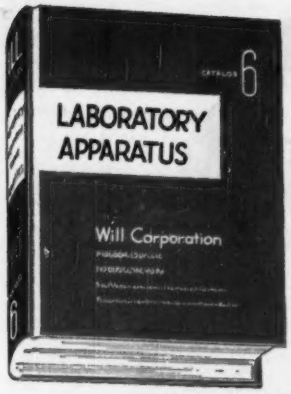

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fully compensated and enclosed in a dustproof housing.

• The new Lifetime **magnet**, produced by Sprout, Waldron & Co., Muncy, Pa., is 50-60% stronger than previous models. Completely welded and built with a stainless steel face plate, this magnet will withstand extreme abrasion.

Unit can be installed in any width in either wood or metal feed spouts, and is a valuable protection against tramp iron entering size reduction machinery, which includes a wide range of processing equipment.

Hinges permit the magnet to be swung down for easy cleaning.

• The Superior Tube Co., Norristown, Pa., has announced the limited availability of Weldrawn commercially pure **titanium tubing.** Analysis limits have been tentatively fixed at: 99.5% minimum Ti; maximum of 0.15% Fe, 0.15% Si, 0.10% Mg, 0.10% Mn, 0.15% N, 0.20% O, 0.05% C.

Three standard tempers, annealed, half hard and hard drawn are being offered and the representative mechanical properties of annealed tubing are:

Ultimate Strength—80,000 psi max.
Yield Strength—40,000 psi min.
Elongation in 2″—25% min.
Hardness, Rockwell B—B 95 max.

Sizes produced range from ¾″ x .049″ wall down to ⅛″ x .010″ wall. It is expected that heavier wall thicknesses in the Weldrawn product and a line of seamless tubing will eventually be offered.

• A low cost jeep **fire truck**, developed by Ansul Chemical Co., carries 340 lb. of dry chemical. A 300 lb. tank of dry chemical is provided for combatting large fires. Two Ansul 20 extinguishers mounted on the hood are available for small fires.

All controls for operating the fire equipment may be worked from the driver's seat. The dry chemical tank may be pressurized on way to the fire.

• A new Superkneader Series double arm type **mixing and kneading machine** has been introduced by the H. W. North Co., Erie, Pa., for any class of service up to 3000 gallons. A lower charging level combined with an unlimited choice of unloading positions are important features. Heavy duty models include intensive type internal mixers for masticating and dispersing rubber stocks, resin paints, plastics, floor coverings and similar compositions.

• New type CSP Life-Line **electric motors** especially designed for applications where corrosive fumes and liquids are encountered, are available from Westinghouse Electric Corp., 306 4th Ave., Pittsburgh 30, Pa.

Frames, brackets, hoods and other exposed parts are sprayed with phenolic-alkyd-type enamel and baked. Additional protection is provided by a coat of gray enamel and two to four baked dips of thermoset varnish, followed by a final coat of gray lacquer.

Bronze split-hub, clamp-type blowers are used for corrosion resistance. Rotating neoprene slingers on the shafts between rear brackets and hoods are used to prevent the entrance of dirt or liquids into the bearing housings.

• New measuring, exhibiting and controlling temperature and pressure instruments are now offered by the Fischer & Porter Co., Hatboro, Pa.

Temperature instruments (Ratotherm) have thermal systems filled with liquid, vapor-liquid or gas covering ranges between −125°F. and +1000°F. **Pressure instruments** (Ratogage) have bellows, multiple-diaphragm, slack-diaphragm or helical pressure-measuring elements covering ranges between 30″ hg vacuum and 10,000 psi.

• By a simplified ball-type seating mechanism instead of a disc, Crane Co., 836 S. Michigan Ave., Chicago, Ill., has improved its **automatic vent and drain valve** to assure more accurate seating and longer life. Operation is fully automatic.

A complete range of sizes takes care of all air requirements up to 150 psi, and water up to 125 psi. Body and cap of the valve are cast iron, the float—copper. The ball seat is Exelloy, and the ball is of hardened stainless steel.

Gaskets

A new cone-type Teflon packing, Chemiseal #810C, has been developed by U. S. Gasket Co., P. O. Box 93, Camden, N. J. It is useful for stuffing boxes exposed to chemical attack and where a freely operating spindle is a must. Because of its shape, cone-shaped rings, the sealing action derives partly from flexing of the cones and does not depend solely on deformation.

• A free-machining **welded stainless tube** is now being made by The Carpenter Steel Co., Alloy Tube Div., Union, N. J. The analysis is Type 303, and consists of carbon .08% max., chrome 17-19%, nickel 8-10%, and se-

lenium .07% min. Tests on threading, rough turning, reaming, and finished machining show the tube to be as machinable as Type 303 bar stock.

• The Polymer Corp., Reading, Pa., is now manufacturing **Teflon** in the forms of **rod and tubing** for machining purposes.

Work Clothing

Work trousers, made with "Vinyon" N yarn, have outlasted wool and cotton as much as ten to one, according to the manufacturer, Chem-Wear Corp., 740 Broadway, New York 3, N. Y.

• A complete line of cast carbon and alloy-steel **safety and relief valves** has been added to the bronze line which Kunkle Valve Co., 111 S. Clinton St., Fort Wayne 2, Ind., has manufactured since 1875. The new constructions include all types formerly manufactured by Star Brass Co., whose facilities have been purchased by Kunkle.

• American - LaFrance - Foamite Corp., Elmira, N. Y., has developed a new fire killer, Foamite Airfoam. It is a stable, cohesive, free-flowing, protein-base foam **fire extinguishing agent.**

Airfoam blankets fire with a thick, stable insulation which cuts off flame-supporting oxygen and smothers the blaze. Foamite Airfoam extinguishers fires both in ordinary free-burning materials and in combustible liquids (Class A and B blazes). It works equally well with fresh water and salt water.

• Wheelco Instruments Co., Chicago 7, Ill., has added a new control system, the Capaciline, to their Capacitrol line of **indicating pyrometer controllers,** Model 252P. The Capaciline compensates for under and over-shooting tendencies of ordinary on-off control.

LOOK WHAT'S NEW IN

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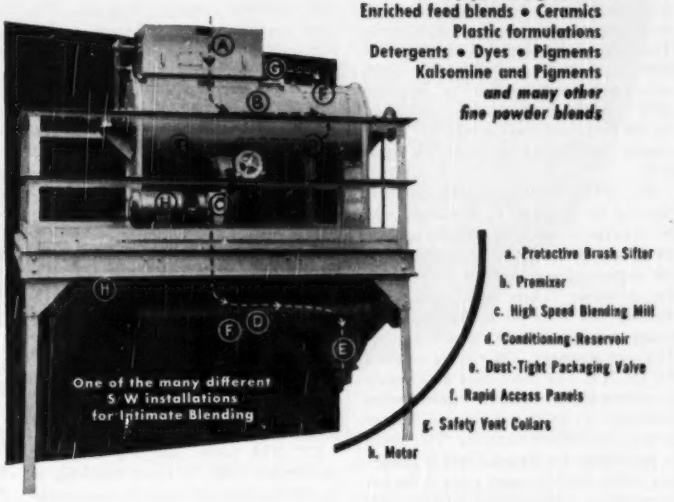
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134

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Review of ICC 37 Series Drums

ICC SPECIFICATION 37 series of drums is commonly referred to as the light gauge drum series in which removable head containers passing all required tests are authorized. Drums in this series are ICC 37D, 37E, 37F, 37G, 37H, and 37K. They are usually used for hazardous powders, solids, and pastes. They differ from containers used for liquids in the procedure usually used for testing them. They are filled with dry, finely powdered material to the authorized gross weight, and dropped from height of four feet onto solid concrete so as to strike diagonally on top chime, whereas drums for liquids usually have water prescribed in drop tests.

ICC 37D drum is the master specification for the 37 series of drums and may be constructed up to 55 gallons, between 24 gauge and 18 gauge, depending upon the authorized gross weight permitted in the container. These authorized gross weights run from 80 pounds for a 24 gauge container to 880 pounds for an 18 gauge container. The closure required for the ICC 37D drum must be adequate to prevent leakage; gaskets required when necessary; to be of screw-thread type or secured by positive fastening. This drum is permissible for certain Class B poisonous solids which in some cases is limited to maximum weights which may be packaged. Reference to the Interstate Commerce Commission Regulations is essential in order to determine the maximum weights permitted. This drum is also permitted for certain viscous inflammable liquids, inflammable solids, and oxidizing material and, again, reference to the weight limitation is essential.

ICC 37E specification container follows very closely the construction required by ICC 37D except that gauges run from 26 to 20 gauge for authorized gross weights between 80 and 880 pounds. The closure requirements are the same as for ICC 37D. It also may be used for certain Class B poisonous solids, viscous inflammable liquids, inflammable solids, and oxidizing material, although it is very important that reference to the Regulations be made because products which may be packaged in the ICC 37D may not be permitted in the ICC 37E.

ICC 37F and ICC 37G also follow very closely specification ICC 37D. The ICC 37F drum may be constructed between 26 and 22 gauge with authorized gross weights from 80 to 880 pounds. ICC 37G may be constructed from 28 to 24 gauge for authorized gross weights between 80 and 880 pounds. It will be noted that the constructions of ICC 37F and ICC 37G are lighter than those required for ICC 37D and ICC 37E for similar authorized gross weights and, again, certain hazardous products which are permitted in ICC 37D and ICC 37E may not be permitted in ICC 37F and ICC 37G. Reference to the ICC Regulations is very essential.

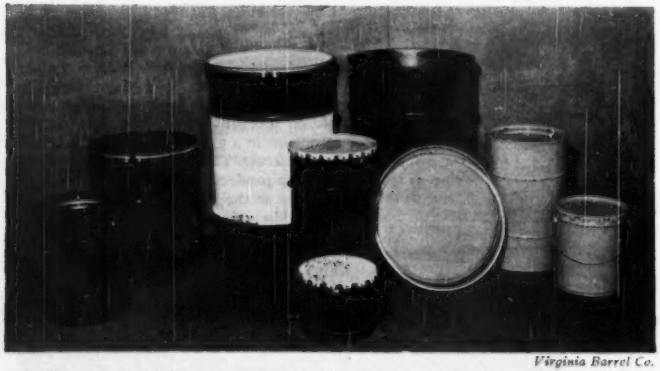
ICC 37H, while complying with ICC specification 37D, is more restricted in its construction and may be constructed between 28 and 22 gauge. However, the authorized gross weight between 5 and 55 gallons runs from 45 pounds to a maximum of 245 pounds. This restricts its use for the shipment of any materials when the gross weight exceeds 245 pounds. There are also restrictions on closure which are as follows:

Closure required—Adequate to prevent leakage; gasket required when necessary; to be of screw-thread type or secured by positive fastening. Filling opening over 9-inch diameter unauthorized, except when consisting of full removable head. Dustproof closure required. If closing device can not be opened and closed without reducing efficiency, container must, when specified on purchase order, be provided with supplementary opening for sampling at least 2 inches in diameter with closing device such that it can be opened and closed without reduction of efficiency.

One of the important uses for this drum is in shipping fused poisonous solids, and it is also used for shipment of viscous inflammable materials, inflammable solids, and oxidizing materials.

ICC 37K is a special 55-gallon 22-gauge drum with an authorized gross weight of 275 pounds and a closure adequate to prevent leakage; to be of bolted ring or lever lock rings only; sponge rubber gaskets required; flowed-in gaskets not permitted. This drum is authorized by the Regulations to provide an additional container for certain domestic and export shipments of hazardous material.

(This series on drums will be concluded in the next issue with ICC specification aluminum and rubber drums.)



Virginia Barrel Co.

ICC 37 series steel drums, commonly referred to as the light gauge series drums, are usually used for hazardous powders, solids and pastes.

New Continental Plant In Operation

Continental Can Co.'s new, multi-million dollar Pittsburgh (West Mifflin Borough) plant, one of the largest in the nation for producing metal containers, is now in operation. Products manufactured include: both flat top and cone top beer cans; oil, paint and grease cans; welded steel pails and drums; and crown caps.

Covering an approximately forty-acre site, ten miles southeast of Pittsburgh, the giant one-story steel frame building has a floor area of approximately 700,000 square feet. Utilizing the latest developments in container production, the new plant has been erected in the Pittsburgh area to consolidate Continental's manufacturing operations in the Pittsburgh-Wheeling vicinity, and to be close to major sources of tin-plate and other essential supplies.

Can Labeling Booklet

A new, revised edition of "Successful Can Labeling," a trouble-shooting booklet published by National Adhesives, is now ready for distribution. Copies can be had free from company headquarters, 270 Madison Avenue, New York City 16, or its domestic and foreign branch offices.

The major portion of the work is devoted to a thorough tabulation of labeling difficulties, their causes and correctives. Among principal troubles listed are staining, rusting, slipping or crooked labeling, loose labeling, failure of machines to pick up labels, tearing, and poor adhesion, curling and wrinkling at the overlap. Recommendations for correction are

Today, manufacturers of many hard-to-pack food and chemical products are actually saving as much as *46 cents per hundred pounds* . . . by packing in Plyolene Multiwall Bags pioneered by St. Regis.

St. Regis Plyolene Multiwalls have a polyethylene coated inner kraft ply which is highly resistant to greases, oil, moisture, alcohol, alkalies and most acids. It is inert, odorless, non-toxic. It adds even greater strength to the naturally-strong St. Regis Multiwall Bag construction.

The economies possible with these new St. Regis Multiwalls include — lower initial container cost, lower storage, freight, packing and handling costs, plus reduced container tare-weight.

If your packaging costs are running high, try St. Regis Plyolene Multiwalls and see the difference they make! Your nearest St. Regis Sales Office will be glad to give you full details on St. Regis Plyolene Multiwalls to fit your special needs.

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based on years of research by National's engineering staff.

"Successful Can Labeling" also discusses spot and overlap labeling methods, both by machine and hand, for cylindrical, square and oval tin cans as well as glass and fibre containers, and touches briefly on label grain direction, type and weight of stocks, etc.

The booklet devotes considerable space to methods for determining can temperatures, and carries a chart and other material from which canners may easily select the proper pick-up gums, both hot and cold.

Folder on Polyethylene Bottle Applications

A four-page folder containing an illustrated summary of 24 recent applications of unbreakable Plaxpak polyethylene bottle in the drug, cosmetic and other fields, has just been published by Plax Corp., Hartford 1, Conn. The effectiveness of this type of container in merchandising such products is made clear by the cover which shows several applications in full color.

Also described are the services Plax provides in connection with its bottles, and there are illustrations of three new stock molds. The folder may be obtained from Plax.

ICC Regulations Amended

Effective April 28, 1950, the following amendments to the Interstate Commerce Commission Regulations which are of particular interest to the chemical industries were promulgated:

Section 73.303 (k) table (formerly sec. 303 (k) table) is amended as follows:

Kind of Gas	Maximum permitted filling density (see sec. 303 (h))	Cylinders marked as shown in this column must be used except as provided in Note 1 and sec. 303(p) (2) to 303(p) (6)
(change)	Percent	
Difluoroethane	79	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225
Difluoromonochloroethane	100	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225
Dimethylamine, anhydrous	59	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225
Monomethylamine, anhydrous	60	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225
Trimethylamine, anhydrous	57	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225
Vinyl methyl ether, inhibited (see Note 7)	63	ICC-4B300, without brazed seams; ICC-4BA300, without brazed seams; ICC-3A300; ICC-3B300; ICC-25

The changes in the above table increase the p.s.i.g. for the 4BA cylinder from 150 pounds to 225 pounds for these items except vinyl methyl ether, inhibited, where this cylinder has been changed to read ICC 4BA300, without brazed seams.

Section 73.31 paragraph (k) (formerly sec. 31 para (k)) has been amended as follows:

(k) All closures of openings in tank cars and of their protective housings must be properly secured in place by the use of a bar, wrench, or other suitable tool. A wrench having a handle at least 36 inches long must be used to apply the outlet valve cap. Manhole covers and outlet valve caps must be made tight against leakage of vapor and liquid, by use of gaskets of suitable material, before cars are tendered to carrier for transportation. Luting materials must not be used in outlet cap or on threads of bottom outlet.

(No change in Note.)

This amendment is of particular importance to all users of tank cars because with gaskets now in use the 48 inch leverage formerly required is unnecessary, and when used may damage the gaskets and cause leakage.

Section 73.106 paragraph (i) (formerly sec. 106(i)) has been cancelled.

Carbon bisulfide is not presently shipped in tank motor vehicles and is no longer authorized.

Section 73.186D paragraph (a) (formerly sec. 186D, (a)) has been amended as follows:

73.186D *Cumene hydroperoxide and tertiary butylisopropyl benzene hydroperoxide.* (a) Cumene hydroperoxide of strength not exceeding 75 percent in a non-volatile solvent and tertiary butylisopropyl benzene hydroperoxide not exceeding 60 percent strength must be packed in specification containers as follows:

The purpose of this amendment is to provide for the shipment of tertiary butylisopropyl hydroperoxide not exceeding 60 percent strength.

Section 73.206 paragraph (a) (2) (formerly sec. 206(a) (2)) has been amended as follows:

(a) (2) Spec. 15A or 15B.—Wooden boxes, with air-tight metal inside containers which must have closing device securely fastened by positive means (not friction).

The purpose of this amendment is to eliminate need for soldering the closure when impracticable or unsafe.

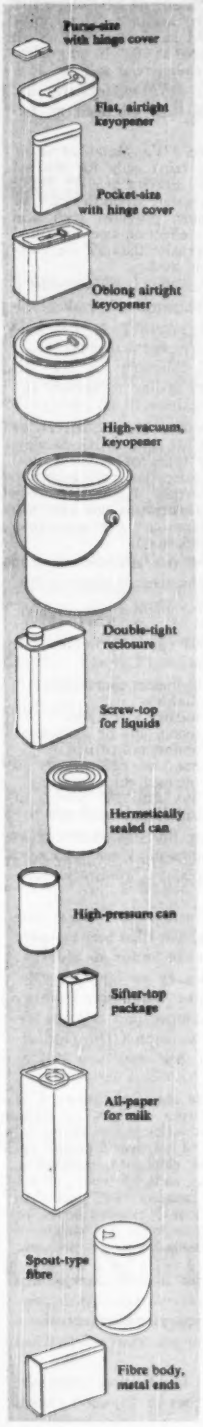
Section 73.261A (formerly sec. 261A) is amended by adding paragraph (j) as follows:

(j) Spec. IEX.—Carboys in plywood drums. Authorized only for export shipments.

This is to authorize a new specification for export shipments.

Section 73.272 paragraph (g) (formerly sec. 272(g)) has been amended as follows:

WHICH PACKAGE SUITS YOUR PRODUCT?



This familiar oblong container comes with either a screw-top or u-press-it fitting. Also available in a variety of sizes with pouring spout, seal closure *and many other types of fittings for consumer convenience.*

Are you considering the consumer when you package liquids?

This container makes friends—keeps 'em!

You know it as the handy can that pours easy, doesn't drip and closes tight.

Advertising experts and sales managers know it as the package that "works with" the label—plenty of space to show your brand in brilliant color.

It now helps sell such products as linseed oil, turpentine, paint and varnish remover, maple syrup, honey.

It could easily do the same robust selling job for liquid detergents, liquid wax or olive oil.

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And how about brass or silver polish, glass cleaners?

To sum up, *this container is ideal for many liquids where positive reclosure is essential.*

Don't you think your package-development experts should get together with ours?

Since 1901 Canco has been responsible for just about every important development in the packaging industry—food and non-food products alike—involving an infinite variety of containers that are metal, fibre or a combination of both.

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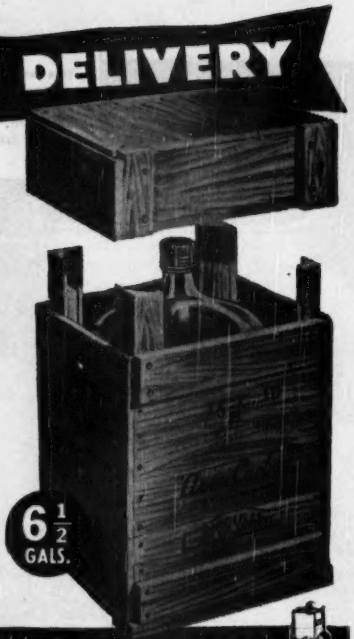

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Many stills, dryers, evaporators, crystallizers and other processing vessels are operating at vacua limited by the vapor pressure of the condensate. This means on the average an absolute pressure of about 2.0" Hg. Most owners of such equipment do not realize how practical and economical it is to put a Booster Evactor in the line between the vessel and the condenser and maintain an absolute pressure of 0.5", 0.25" or even lower. The benefits of this higher vacuum in improving quality and capacity are often very substantial.

The steam jet type of vacuum pump has continually gained in favor for high vacuum in industrial process work. The total absence of moving parts is a big advantage and means many years of service, with no maintenance cost. Available in single, two-, three-, four- and five-stage units for vacuum from a few inches up to a small fraction of 1 m.m. Hg. absolute.

Croll-Reynolds have been specializing on this type of equipment for over 30 years, and have made thousands of separate installations. Their engineers have extensive experience in applying it to numerous different processes, and are available for consultation without obligation. Literature is also available on request.

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CHILL-VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

(g) Spec. 5A.—Metal barrels or drums only for acid of 1.7019 specific gravity (59.8° Be.); or acid of greater strength with or without inhibitor, provided such acid has a corrosive effect on steel measured at 100° F. no greater than 66° Be. commercial sulfuric acid.

Section 73.272 (g)(1) (formerly sec. 272(g)(1)) has been amended as follows:

(g) (1) Spec. 17F.—Metal barrels or drums (single trip) only for acid of 1.7019 specific gravity (59.8° Be.); or acid of greater strength with or without inhibitor, provided such acid has a corrosive effect on steel measured at 100° F. no greater than 66° Be. commercial sulfuric acid.

The purpose of these amendments is to provide for shipment of weaker sulfuric acid than presently permitted in Spec. 5A and 17F metal drums.

Section 73.272 (formerly sec. 272) has been amended by adding paragraph (q) as follows:

(q) Spec. 5C.—Metal barrels or drums of type 304, 316, or 347 stainless steel or other types of stainless steel of equivalent corrosion resistance and physical properties. Authorized only for acid of concentration not less than 100 percent (approx.) nor more than 115 percent (approx.).

The purpose of this amendement is to provide for the shipment of oleum in ICC 5C stainless steel drums.

Section 73.303 paragraph (p)(7)(e) (formerly sec. 303 (p)(7)(e)) has been amended as follows:

(p)(7)(e) Cylinders containing:
(1) fluorine
(2) methyl mercaptan
(3) mono, di, or trimethylamine, anhydrous
(4) not over 10 pounds of nitrosyl chloride
(5) less than 165 pounds of anhydrous ammonia

The reason for this amendment is to provide an exception of cylinders charged with methyl mercaptan or nitrosyl chloride.

Section 73.303 paragraph (q)(7) (formerly sec. 303 (q) (7)) has been amended by placing liquefied sulfur dioxide gas in the same category as liquefied chlorine gas regarding maximum quantity which may be shipped in a tank car.

Section 73.352 paragraph (b) (formerly sec. 352(b)) has been amended as follows:

(b) In inside glass, earthenware, or composition bottles or jars, or metal containers, or lock-corner sliding-lid wooden boxes, of not over 5 pounds capacity each, or chipboard, pasteboard, or fiber cartons, cans, of boxes, of not over 1 pound capacity each, packed in outside wooden or fiberboard boxes, or wooden barrels or kegs. Net weight of contents of outside container, not over 100 pounds.

This amendment includes composition bottles to take care of other than present bottles now prescribed for exceptions in the shipment of poisonous solids, Class B.

A new ICC specification container, 1EX, Glass Carboys in Plywood Drums

HOW TO DROP $10,000.00

and not lose a cent

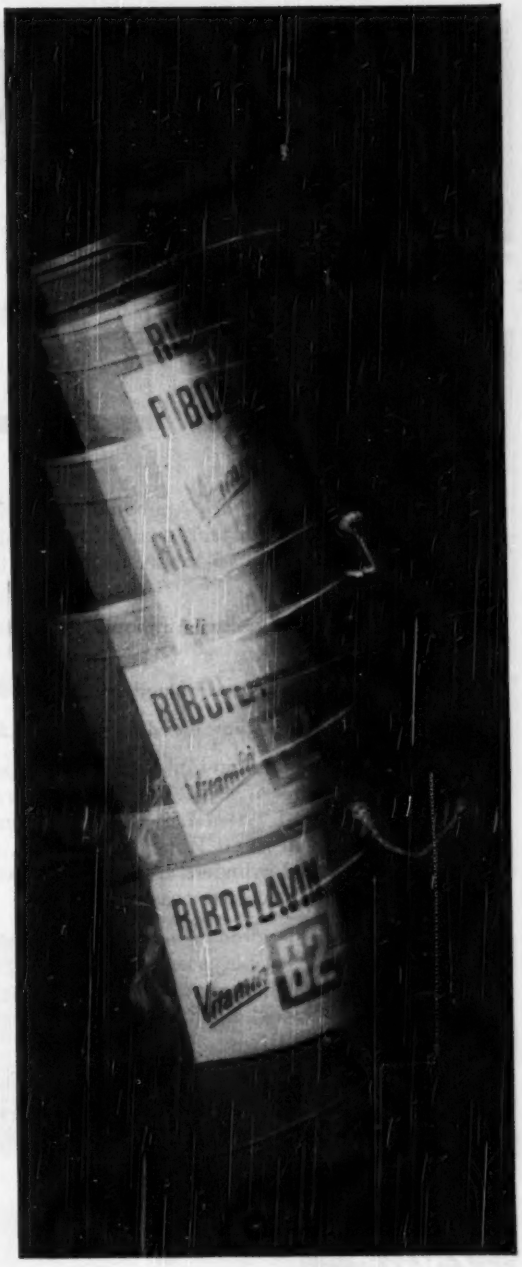
If you shipped riboflavin—a widely used vitamin—the very thought of somebody dropping one of your shipping drums would give you gray hairs. A single drum of riboflavin is worth upwards of $10,000. But one of Continental's regular line of shipping drums—the Leverpak drum—is the choice of many companies for safeguarding their most valuable products.

The stroboscopic photograph at the right shows a Leverpak drum containing four hundred pounds dropping four feet. It didn't leak, shatter or fracture. *Not a penny's worth of the contents will be lost!*

This Leverpak drum is just one example of Continental's ability to develop packages to meet exacting requirements. Like all Continental drums, it is light in weight to save shipping costs, and can be furnished in a wide variety of linings and coatings.

Whatever your product, Continental can supply you with a package that will stand up in service, stand out in appearance. Continental is famous for its fine lithography and decorative work. Drum, can, or paper container—if you have a packaging problem, our technical staff is ready to help you solve it. Continental is big enough and flexible enough to handle any packaging situation.

DRESS UP YOUR PRODUCT WITH A CONTINENTAL DRUM. Three types to choose from. The Leverpak drum, with its unique lever-locking device, for maximum protection under hard usage. 12- to 75-gallon sizes. . . . .The Fiberpak drum—a rigid, light, all-fibre container in ¾- to 67-gallon sizes. . . . .The Stapak drum with fibre body and metal top and bottom. Supplied in 2- to 32-gallon sizes.



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Barrett Standard Anhydrous Ammonia is America's leading source of NH_3. Its dependable quality, consistent purity and uniform dryness have made it the standard for the chemical industry since 1890.

Barrett Standard Anhydrous Ammonia is available in two grades:

▶ **Refrigeration Grade, guaranteed minimum 99.95% NH_3.**

▶ **Commercial Grade, guaranteed minimum 99.5% NH_3.**

Both grades are shipped in tank cars with a capacity of approximately 26 tons of NH_3. Refrigeration Grade only is also packaged in 150, 100 and 50-pound cylinders. Tank car shipments are made from Hopewell, Virginia, and South Point, Ohio. Loaded cylinders are stocked at points conveniently located from coast to coast.

Barrett Standard Anhydrous Ammonia passes rigid tests for moisture, non-condensable gases and other impurities, before release for shipment. Cylinders and tank cars are thoroughly cleaned and inspected, upon return to the plant, before reloading.

The advice and help of Barrett technical service men are available to Barrett customers without charge. For information, contact Barrett, *America's leading distributor of ammonia.*

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ALLIED CHEMICAL & DYE CORPORATION
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for Export Only, has been approved by the Interstate Commerce Commission. This new specification allows the use of 5 to 6½ gallon capacity bottles to be placed inside a plywood drum for export shipment of certain liquid products. Reference to the complete specification ICC 1EX is necessary for anyone contemplating use of this newly approved container.

ICC specification 5B has been amended mostly for clarification. However, the Regulations have also added the following note to this specification:

> Note: Rolling hoops or pliable solid rubber or other material are also authorized when approved as to type and construction by the Bureau of Explosives.

Section 73a.17C-9(c) (formerly sec. 17C-9(c) has been amended as follows:

> 9(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Threaded closures having fewer threads are authorized for containers having a capacity of 12 gallons or less when such closures are approved by the Bureau of Explosives upon proof of satisfactory tests.

The purpose of this amendment is to provide for closures having less than three threads on small containers.

Specification ICC 22A has been amended by cancellation of certain paragraphs. Reference to this new specification is necessary for anyone using ICC 22A plywood drums.

Specification 23F has been amended to provide additional methods of closing which have been found satisfactory. Reference to this specification by anyone using it is also essential.

ICC 17H has been amended as follows:

> 9(b) Drums over 5 gallons capacity must be closed by means of 12 gage bolted ring with drop forged lugs, one of which is threaded, and having ⅜ inch bolt and nut for drums not over 30 gallons capacity and ⅝ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives.

The reason or this amendment is that forged lugs on small containers to accommodate ⅝ inch bolt extend beyond practical limit for expanded rolling hoops so that proper rolling clearance is not obtained.

MCA Manuals Revised

The Manufacturing Chemists' Association has published revisions of Chemical Safety Data Sheets SD-1 Formaldehyde and SD-6 Paraformaldehyde.

Copies of these Data Sheets may be obtained at 20 cents each from the Manufacturing Chemists' Association, Inc., 246 Woodward Building, Washington 5, D. C.

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*BLASTING

Sulphur is blasted from the face of the vat as it is required for shipment. Vertical holes are drilled from the top of the vat, each hole being charged and exploded. Most of the sulphur is thereby broken into pieces of a size suitable for loading, such large pieces as occur being broken by hand to sizes which can be conveniently handled. Locomotive cranes load the sulphur into railroad gondolas, hopper bottom, or box cars. Such molten sulphur as is shipped is loaded direct from the pipe lines bringing sulphur from the producing wells.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

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For Complete Information Write for Brochure C.

The EMIL GREINER Co.

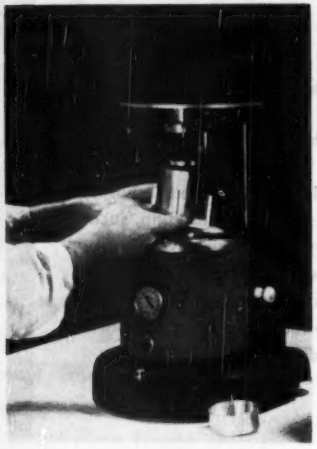
20-26 N. Moore St. New York 13, N. Y.

LABORATORY EQUIPMENT

Viscosimeter

Viscosity measurements now made directly in centipoise units and without calculations.

The new Electroviscosimeter of Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa., comprises a stand on which the sample is held in a sample cup and revolved at constant speed around a "bobbin." This central element is movable and



can be turned in opposition to the natural pull of the liquid under study as shearing force is exerted against the bobbin. A magnetic field, to which variable amounts of electrical force can be applied, is created around the bobbin adjustive by control knobs on the separate power supply and meter unit. When the magnetic force applied to the bobbin exactly counterbalances the mechanical force exerted by the rotating liquid, the viscosity is expressed in centipoise units read directly from the scale of the instrument.

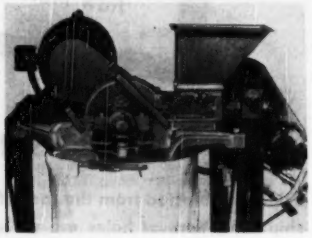
Two sizes of bobbins, one for liquids of low viscosity (0-500 centipoises), and one for heavier liquids of 500 to 5,000 centipoises are available.

Goniophotometer

Tristimulus filters permit measurement of color effects of surfaces.

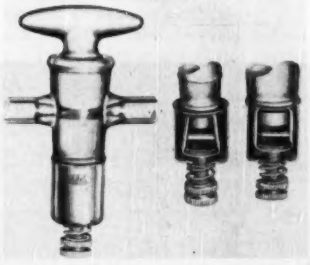
What is believed to be the first goniophotometer offered with tristimulus filters for measurement of color as a function of illumination and direction of view is offered by Henry A. Gardner Laboratory, Inc., Bethesda, Md. For the first time, according to the maker, instrumental studies of color effects produced by metallic pigments, bronzing, special textile coatings and similar appearance phenomena are possible. The apparatus may also be used for detailed measurement of turbidity, translucence, and the haze of specimens due to light scattering.

• For fine grinding, granulating or wet milling the new Model B Pulva-Sizer is



compact and dustless in operation. It is being manufactured by Pulva Corp., 550 High St., Perth Amboy, N. J. The new **mill** is an impact or swing hammer type with twin screws for feeding unground material directly to the face of the hammers. The feed screws are available in three diameters to handle material from free flowing powder to pieces up to approximately 3" size. Capacity depends on the nature of the material.

• A single size **universal adapter** which will convert any glass stopcock up to and including 4mm. bore to a pressure



tight stopcock has been introduced by Emil Greiner Co., 20-26 North Moore St., New York 13, N. Y. Manufactured completely of corrosion resistant materials, this new stopcock adapter eliminates the annoyance of leaking stopcocks and the high cost of special pressure stopcocks.

• Stainless steel **sanitary shovels**, both scoop and square point types, are now being fabricated by Metalsmiths, 560 White St., Orange, N. J. These shovels are completely stainless throughout, including blade, tubular handle and dee grip. All lodging places that might trap materials handled are eliminated.

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No commonly available material matches perfectly all the specifications for analytical balance weights. Permas* was developed especially to conform to specifications prescribed by the Fisher Development Laboratory. Permas is the only metal specifically compounded for analytical weights, and it contains more than 50% non ferrous material.

Permas Weights are manufactured exclusively by the Fisher Scientific Company and Eimer & Amend. They are adjusted to tolerances well within the range required by the National Bureau of Standards.

Permas Weights are harder. The surface resists abrasive action better than brass, bronze, gold, platinum, or any plating used on analytical weights.

Permas Weights are non-magnetic. They will not attract metallic particles and they are not affected by the damping magnets frequently used in analytical balances.

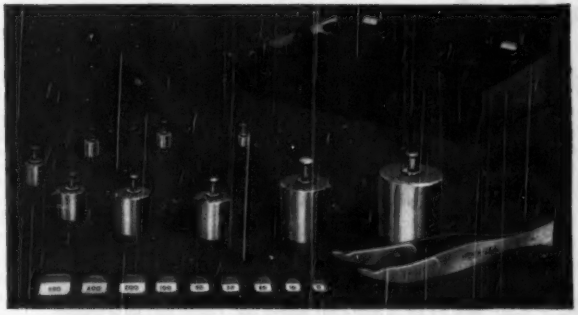
Permas Weights are corrosion resistant. They are not altered by the corrosive fumes often encountered in the laboratory.

Permas Weights are not lacquered or plated. They do not have the disadvantage of taking up moisture as all lacquered surfaces do.

Permas Weights are machined, by tungsten carbide tools, from rolled bar stock and polished to a permanent, durable, mirror-like finish.

*Permas—*permanent mass*—is a coined word, registered in the U. S. Patent Office, and is pronounced per'-mass.

Write for full information on all Fisher Permas Balance Weights.



The 100-gram set of Fisher Permas Weights illustrated at right is adjusted to tolerances required by the National Bureau of Standards for class "S" analytical weights. Price $52.00

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In Canada: Fisher Scientific Co., Ltd., 904 St. James Street, Montreal, Quebec

INDUSTRY'S BOOKSHELF

Elements of Patent Law *by Fred H. Rhodes.* Cornell University Press, Ithaca, N.Y., 1949; 190 pp., $2.75.

Patent Practice & Management for Inventors and Executives, *by Robert Calvert,* Scarsdale Press, Scarsdale, N. Y., 1950; 372 pp., $5.

Patent Tactics and Law, *Roger Sherman Hoar,* third edition, The Ronald Press Co., New York, 1950; 352 pp., $7.

THESE THREE books all have the same general purpose: to acquaint business executives, engineers and inventors with enough of the fundamentals of patent procedure to enable them to understand and cooperate with their attorneys in patent matters.

The Rhodes book is the most readable of the three, although more limited in content than the other two. It discusses in unusually lucid fashion the basic concept of invention, the various steps leading up to a patent, and the rights and limitations conferred by a patent. Dr. Rhodes is professor of chemical engineering at Cornell University. Of particular interest to chemical readers will be his preference for chemical patent cases in selecting the court decisions and Patent Office rulings to support and illustrate his discussions.

Dr. Robert Calvert, author of the second book, also has a chemical background. He has served as a research laboratory director with the du Pont Co. and is a former member of the patent department of Johns-Manville Corp. His book emphasizes the problems that most frequently concern the inventor and the executive. They are discussed in an over-the-desk-manner that carries not only the ring of authority but also the easy assurance that comes from long and varied experience. Although reference is frequently made to significant court cases, the author relegates these to a minor and purely supporting role. The book admirably fulfills its aim to explain to executives and inventors not merely the law of patents but also what to do about it under the circumstances in which they find themselves.

Although its author has no connection with the chemical industry, the third book is one that has already earned a high reputation as a non-technical reference on patent matters. The present third edition contains a number of revisions as the result of extensive changes in March 1949 in the *Rules of Practice* of the Patent Office. Especially noteworthy in the new material are the changes in the handling of appeals within the Patent Office. A distinguishing characteristic of this book is the reflection throughout of the author's belief that patent "tactics" are as important to the executive as to the attorney and that they should not be left strictly to the attorney. Unless the client thoroughly understands the tactics of his patent cases, the author contends, he will not be able to decide intelligently the questions which his attorney puts to him. The book is especially valuable in its treatment of this aspect of patent law.

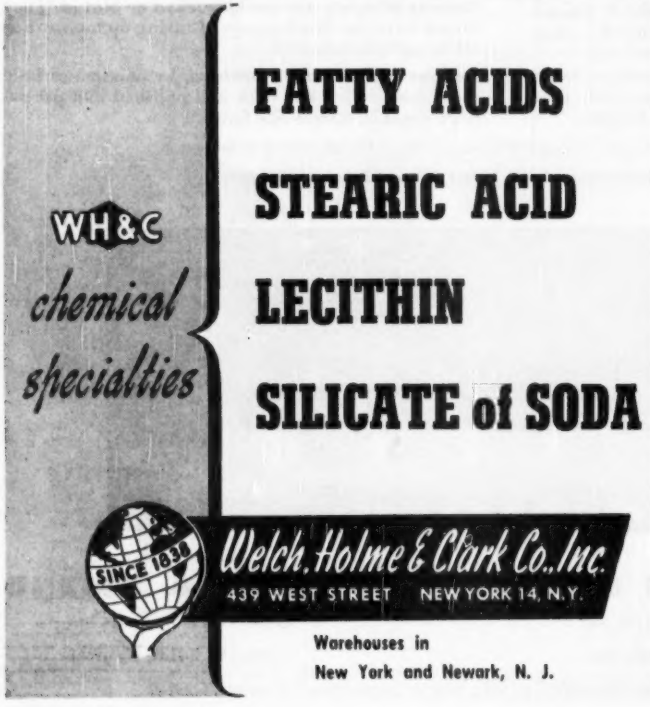
The Alchemist, *by F. Sherwood Taylor.* Henry Schuman, Inc., New York, 1949, 246 pp., $4.

THE HOPELESS pursuit of the practical transmutation of metals was responsible for the development of almost all chemical technique before the middle of the seventeenth century, and further led to the discovery of many important materials.

This is the first book to distil and interpret for the non-scholar what is known about this early work, as well as the points of view and philosophies of the alchemists themselves. It covers the period from the Greek and Egyption beginnings of alchemy up through the Lullian treatises to Paracelsus and Boyle. Based on some twenty years of study by the author, who is curator of the Museum of the History of Science, Oxford, England, the book is both authoritative and highly readable.

Chemical Inventions and Chemical Patents, *by Edward Thomas.* Mathew Bender & Co., Inc., Albany, N. Y., 1950, 881 pp., $16.50.

THIS is a book primarily for patent attorneys. It brings up to date and puts into easily readable form the substance of the author's prior *Law of Chemical Patents.* It is comprised of six parts, as follows: Surveying Prospective Patent Rights in an Invention; Appraising the Patent Rights; Formulating the Patent Rights; Construing Formulated Patent Rights; Acquiring Formal Patent Rights; and Exploiting Acquired Patent Rights. Special emphasis is placed on methods for forestalling pitfalls in future contests when preparing patent applications, pitfalls in digging up evidence, and pitfalls in conducting litigation or fighting interferences. All recommendations and warnings are supported by reference to the decided cases pertinent to chemical patents.



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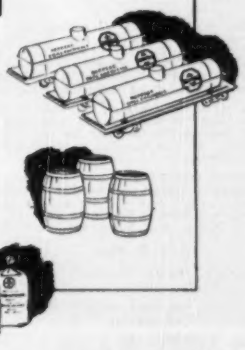

POTASH LEASES

(UNITY AREA)

The Saskatchewan Department of Natural Resources will accept tenders for lease rights to potash minerals for the period up to and including 5.00 p.m., June 15, 1950, in the area described below:

All townships from No. 35 to 45 inclusive, in ranges 15 to 28 inclusive, west of the 3rd meridian, a total area of 147 townships and 7 part townships.

Tenders shall include all minimum lease requirements as stipulated below, and such bonus in form of increased royalty rates as the bidder may decide. A $5,000 fee, in the form of money order, bank draft, or certified cheque, payable to the Department of Natural Resources, must accompany the tender, to be applied to the performance bond noted in (2) below, if tender is accepted.

Tenders will state the method of mining proposed, give an estimate of cost of construction of necessary production facilities, and an outline of the proposed method of financing the project.

Highest or any offer will not necessarily be accepted. Money accompanying unaccepted offers will be returned to the bidder.

Minimum terms of the lease are as follows:

1—Lease area, term, and rental rate.
Minimum area of lease which may be taken at this time is 4 sections, or 2,560 acres. Rental on such lease shall be at the rate of $1.00 per acre per year. Term of lease shall be 21 years, renewable for second equal term.

2—Performance clauses.
The mine and refining plant required for production from this lease must be producing a finished product for sale by the end of the 3rd year from date of signing lease. A $25,000 cash performance bond shall be posted with the Department immediately before signing of such lease, repayable to the lessee within 15 days of commencement of production, if such production is accomplished within the stipulated period.

3—Royalty rates.
Subject to such bonus as the bidder may offer, royalty shall be paid on a sliding scale, varying with the sale price of product at the plant, determined by a formula which results in the following royalty schedule:

Selling price per ton	Royalty per ton
$12 and less	$ .50
$13	.55
$14	.60
$15	.65
$16	.75
$17	.85
$18	.95
$19	1.10
$20	1.25
$21	1.40
$22	1.60
$23	1.80
$24	2.00

Royalty of 20% on all selling price increments above $24 per ton. The royalty return to the Department shall be set at a minimum of $5.00 per acre leased, in the first 12 months of production, and $10.00 per acre leased for each succeeding year.

Geological information, analysis of potash cores taken in the area to date, and such other information as may be available and required, will be supplied by the Department upon request.

Tenders may be mailed or delivered to the undersigned, sealed and marked "Tender for Potash Lease", and will be opened and recorded in public at 5.00 p.m. June 15, 1950, in the Resources Building, Regina.

C. A. L. HOGG,
Deputy Minister,
Department of Natural Resources and Industrial Development.

Regina, April 25, 1950.
GOVERNMENT OF SASKATCHEWAN

Farmer Victorious, by *William J. Hale.* Coward-McCann, Inc., New York, 1949, 242 pp., $3.

REMINISCENT of some of Billy Hale's previous books, Farmer Victorious lifts the torch anew for greater use of farm crops as industrial raw materials. Only by the closer meshing of farm and factory, avers the author, can we avoid the "sinister influences of Mammon, foreign trade, and improper diet [which] have wreaked vengeance upon one people after another." The point of the present books seems to be to say that this point of view is making headway. Like its predecessors, it suffers from an overdose of preachment and a deficiency of economic fact.

The Instrument Manual, United Trade Press, Ltd., London, England, 1949, 548 pp., 70s.

THIS BOOK is an extensive review of industrial instruments used for test, measurement and control purposes. In addition to describing the construction, operation, and application of industrial instruments, this volume also includes a bibliography of recent pertinent literature, compilations of British Standards Institution specifications, a list of organizations and publications devoted to instruments as well as a buyer's guide and directory of British instrument manufacturers.

Organic Chemistry, *by Paul Karrer.* 4th English ed., Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y.; xxi + 973 pp., $8.50.

IN THE fourth English edition of this textbook various chapters have been revised and extended and several new sections have been added. For example, sections on the following subjects have now been included: polysiloxanes, peracids, organic compounds containing isotopic carbon and nitrogen, etc. The following parts have undergone substantial alteration or change: the chapters on elementary microanalysis, mineral oil products, organic lithium compounds, estrogenic substances (doisynolic acid, synthesis of estrone), vitamins (pteroylglutamic acid, vitamin A), the coloring matter of blood and related compounds, alkaloids (retronecine alkaloids, solanine-solanidine, N-methylmorphinan synthesis, etc.), and cyclooctatetraene.

The Transuranium Elements, *edited by G. T. Seaborg, J. T. Katz, and W. M. Manning.* McGraw-Hill, New York, xxxvi + xii + 1732 pp., $15.

THIS collection of papers is a technical account of information collected while developing methods for producing plutonium. Some of the information deals directly with nuclear physics and chemistry; most of it is related, however,

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to technical processes that needed to be performed in preparation for making plutonium. These publications represent selections from the great mass of current reports, made on the basis of their value to basic science and technology.

Solvents, *by T. H. Durrans.* D. Van Nostrand Co., Inc., New York; xv + 242 pp., $6.

THE GENERAL form and scope of this sixth edition remain much the same as in previous editions, but the chapter on toxicity has received a comprehensive overhaul and extension in the light of recent discoveries and opinions. Other chapters in the "theoretical" section of the book have also been extended. The descriptive material has been revised, data checked or amended in conformity with the most recent figures, and much fresh information has been added particularly as regards certain new plasticizers and plastics.

Refractories, *by F. H. Norton,* 3rd ed., McGraw-Hill Book Co., New York, N.Y. 1949; 782 pp., $8.50.

THIS BOOK was written to provide a treatise on refractory technology and deals with the manufacture and use of refractory materials. Descriptions have been limited to American practice.

Advances in refractory technology since the second edition in 1942 necessitated this new edition. Because of space limitations and the large amount of recently published material in the field of crystal chemistry, the author has omitted the chapter on fundamental concepts of matter. However, this has been replaced by four new chapters: one on laboratory furnaces, one on high temperature refractories, and chapters on refractories for nuclear energy and jet propulsion.

Principles of Electroplating and Electroforming (Electrotyping, 3rd ed.) *by William Blum and George B. Hogaboom,* McGraw-Hill Book Co., Inc., New York; 1949; 455 pp., $6.00.

PLATERS, engineers and chemists will find interest in this summary and digest of current knowledge of electroplating theory and practice. Principles of electrochemistry and physics fundamental to the plating process are explained, as well as developments in the industry. The different methods of analyzing plating solutions are covered, as are methods of preparation for plating, and equipment.

The commonly used metals are dealt with extensively. A feature of this subject coverage, which aids application of the specific data given, is the arrangement in the same sequence as in the periodic system of the elements.

Deposition on plastics and on alloys is also included in this work.

Printing and Litho Inks, 4th ed., *by Herbert Jay Wolfe,* MacNair-Dorland Co., New York; 1949; 478 pp., $7.50.

BOTH practical and theoretical aspects of inks are covered in Mr. Wolfe's new edition. It gives the ink maker a knowledge of constituent materials, and of printing presses and printing surfaces in current use, to enable him to formulate suitable inks for each. Wide coverage is accorded the raw materials, snice acquaintance with them is essential in scientific formulation of inks. Many formulas are included, but these, though practical, are intended more for illustrative purposes.

For general background the author includes a history of ink making. Also of interest is a brief and explicit treatment of the many methods of testing raw materials and finished inks as currently used in industry. An extensive chapter deals with theoretical aspects of wetting, dispersion and rheology, subjects of concern to both chemists and technicians.

Increased use of colored inks finds expression in the wide emphasis throughout the book on the many types of pigments and colored inks.

Principles and Practice in Organic Chemistry, *by H. J. Lucas and D. Pressman.* John Wiley & Sons, Inc., New York; xi + 557 pp., $6.

THIS BOOK is designed as a laboratory reference for workers in the field of organic chemistry and as a laboratory manual for students of organic chemistry.

Agricultural Chemistry (Vol. 1, Principles), *Donald E. H. Frear, editor.* D. Van Nostrand Co., Inc., New York; 812 pp., $9.00.

THIS REFERENCE text on agricultural chemistry is intended for graduate students, specialists engaged in agricultural work—county agents, Federal and state extension workers, and representatives of commercial firms—and research investigators in agricultural sciences. The first volume deals with the more fundamental phases of agricultural chemistry and of physiological processes of plants and animals; the second volume, practical applications of agricultural chemistry. The first will probably be most useful to teacher and researcher; the second, to the practicing agricultural specialist.

Individual chapters are written by recognized specialists with little change in their manuscripts by the editor. A good general knowledge of organic and inorganic chemistry by the reader is assumed.

The first volume is divided into five parts: Some Fundamental Materials and Processes Common to Plants and Animals; Chemical Processes of Fundamental Importance in Agriculture; Plant Chemistry; Animal Chemistry; and Soil Chemistry.

Mixers

(Continued from page 850)

The mixing head of the AMF Oakes continuous mixer[5] consists of a vertical rotor operating between two stator plates. Feed enters at the center of the back stator and is acted on by a ring of lugs on the rotor, which pass between lugs on the front stator. Mixed paste discharges through an opening in the center of the front stator. Air or gas can be injected with the material as it enters the mixing head. The time of mixing is 3 to 5 seconds; throughput rates with fairly thin pastes range up to 500 gallons per hour. The AMF Oakes continuous mixer is used in such operations as production of foam rubber and mayonnaise. A continuous centrifugal mixer for pastes and powders has recently been developed by Read Machinery.[53]

Pulverizers also serve as blenders. The Rietz Disintegrator,[54] primarily a size-reduction device, is widely used for preparing smooth blends of pastes and powders. A four-bladed vertical rotor turning at 3600 r.p.m. in a vertical perforated cylinder grinds and mixes material by impact. The feed is usually premixed in conventional batch mixers. Mixing applications include insecticides, dyes, briquetting mixtures, peanut butter, and the dissolving of cellulose in rayon manufacture. The Mikro Pulverizer,[52] a hammer mill, also provides an intensive mixing action.

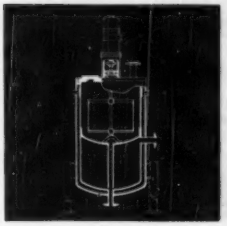
The Marco Homogenizer[42] consists of two co-axial rotors operating between stator plates; various designs are available for blending, dispersing, masticating, and shredding. The feed may be liquids, pastes, or solids, and gases can be incorporated in the mix as well. Liquids and pastes are picked up by the rotors and carried to a compounding chamber where the rotor teeth, moving at 450 r.p.m., set up an intense combination of mechanical and hydraulic shear. Leaving the compounding chamber the product impinges on a conical valve to complete homogenization.

The Kom-bin-ator pump section is similar to that of the Homogenizer, forward of which is a chamber through which the lower shaft of the pump extends. One to 5 milling rotors operating between stators may be attached to this shaft. The material is first mechanically compounded in the pump section and then finally broken down and dispersed between the rotors and stators. In the Tempering Kom-bin-ator the stators are cooled.

Marco machines operate under vacuum or at pressure up to 900 psi. They have been very successful in food proc-

(*Turn to page 945*)

*5 Additional KETTLE DESIGNS by PATTERSON-KELLEY

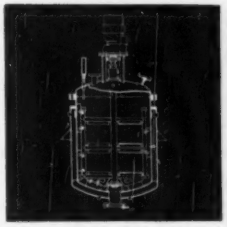


K Vacuum Wax Impregnating Centrifuge

Steam-Jacketed with upper and lower chambers under separate pressure controls. Hot wax is in lower chamber while basket is being charged. For impregnating phase, wax is forced to upper chamber; after impregnation, pressures in two chambers are equalized and the basket spun to eliminate excess wax which returns to lower chamber.

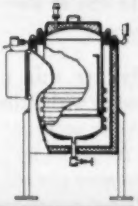
L High Pressure Hydrogenator

Combines electrical and steam heating; steam passing through an internal coil being used to shorten initial heating-up period; electrical heating elements provide desired high operating temperature. Reaction completed, cold water is admitted to steam coil to promote rapid cooling.



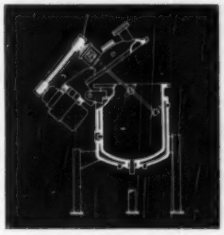
M Nicotine Extractor

Heavy duty unit for processing powdered tobacco; meets the need for scraping type agitator and sparger system for uniform distribution of steam to all parts of the charge; steam enters through sealed hollow shaft at the top, passes out through perforated paddle arms; special dump valve at bottom.



N High Pressure, Electrically-Heated Sterilizer

Completely self-contained with automatic pressure control switch, safety valve and insulated jacket.



O Vacuum Process Vessel

Sanitary type; unique setting of motor counter balancing quick opening cover, permits quick and clear access for cleaning out; all interior parts polished; multi-speed motor.

Designing Special Kettles is an important phase of Patterson-Kelley service. We have, of course, standard carbon steel and stainless steel jacketed kettles in a wide range of sizes. But we are greatly experienced in designing special kettles to meet unusual conditions, as illustrated. In writing for further information, describe fully your requirements.

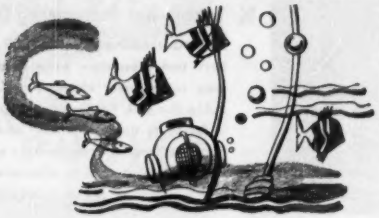
Offices or Representatives in Principal Cities

the Patterson-Kelley Co., Inc.

*Send for our Kettle Bulletin

17 Lackawanna Avenue East Stroudsburg, Pa.

Will Your Product Meet Extremes of Humidity?



. . . Investigate ATLAS SORBITOL!

Do you get complaints about your product when it has been stored in a damp, humid place? (Not necessarily as damp as the Davey Jones locker our artist has visualized . . . but maybe just ordinary "summer" humidities!)

If you make products like gaskets, paper specialties, adhesives, pharmaceuticals, confections, foods—you are fully aware of the way high humidities can play havoc—making some products swell, others become sticky or soggy, still others lose one or more desirable characteristics.

Sorbitol is a conditioner that especially fits this problem because, compared with other polyols, it *varies less in moisture content with changes in humidity!* Moreover, it remains *more viscous* at high humidity, helping counteract softening action of excessive water.

Sorbitol is *plentiful*, and its price trend is *downward*. So check into its advantages *now*. Write for the Atlas sorbitol book, or consult the Atlas technical staff.

ATLAS CHEMMUNIQUÉ

Span Emulsifiers Help Stop Rust*

Span types of emulsifiers find increasing use as ingredients in petroleum products as rust-inhibitors. The concentrations used are from 0.5 to 5.0% of the oil.

Hair-Wave Lotion Improved by Emulsifiers

Most hair-wave compositions have been limited to about 5% ammonium thioglycollate, because this ingredient usually causes emulsions to break when larger amounts are used. Span* 80 and Tween* 80 emulsifiers, however, make it possible to use 8% of the active ingredient. U. S. Patent 2,479,382 describes the method.

Less Heat Effect on Hystrene† Stearic Acids

The new Hystrene stearic acids sold by Atlas keep their excellent color and odor features even at the high heat needed for esterification, etc. Probably this is due to extremely low "unsaps" (less than 0.2%) and unsaturates content (less than 0.5) Iodine Value!

*Reg. U. S. Pat. Off.
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Protective Coatings C224
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Cylinders K428
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Conveyors K429
4-p. bulletin describes features of conveying systems. J. C. Corrigan Co., Inc.

Classifiers and Separators K430
20-p. bulletin describes principles of operation and construction details of wet classifications and heavy-media separation devices. Flow sheets included. Bulletin 39-B, Hardinge Co., Inc.

Control Devices K431
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6-p. bulletin describes advantages and operation of solenoid air-operated valve. Bulletin AU250, The Bellows Co.

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Miscellaneous

University of Maine K485
16-p. booklet describes plan for expanding the program for industrial cooperation at the University of Maine.

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40-p. "1949 Annual Review" describes activities of Allis-Chalmers in 1949 and some of the equipment introduced by the company.

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Cloud Point °F	38° - 42°	46° - 49°	63° - 71°
Color Lovibond 1" Red	4 - 7	4 - 7	4 - 7
Color Lovibond 1" Yellow	20 - 40	20 - 40	20 - 40
Unsaponifiable Per Cent	2.5 max.	2.5 max.	2.0 max.
Saponification Value	196 -199	196 -199	197 -200
Acid Value	195 -198	195 -198	196 -199
%F.F.A. as Oleic Acid	98 - 99.5	98 -99.5	98.5-100.0
Iodine Value	90 - 93	88 - 91	80 - 85

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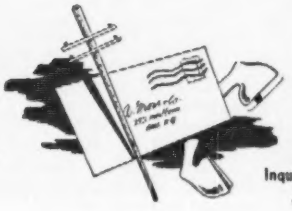

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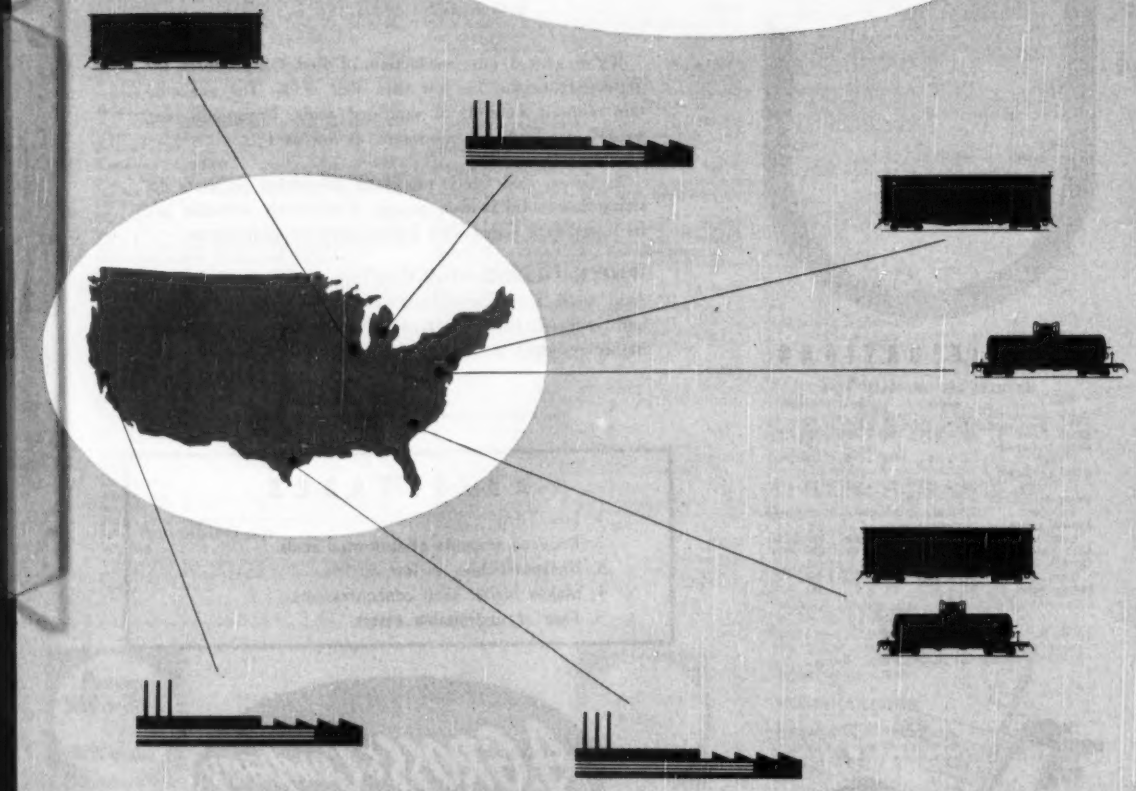

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NEWS OF THE MONTH

New Construction

• **The largest phosphorus furnace** in the world and one of the largest electric furnaces ever built will be constructed at Monsanto, Tenn., by Monsanto Chemical Co. The new furnace, to have a capacity of 25,000 KW, is expected to be completed during January, 1951.

Monsanto will expand production facilities for sodium and ammonium phosphates at its Phosphate Division's Trenton, Mich., plant and for calcium phosphate at the division's Carondelet, Mo., plant.

Parker Frisselle (left), appointed manager of Market Research for the Dow Chemical Co.; and William T. Hack named manager of the Product Development Dept., Ethyl Corp.

• **New unit to manufacture Orlon** acrylic fiber in staple form will be constructed at Camden, S. C. by E. I. du Pont de Nemours & Co. The new plant will be a separate unit next to a new yarn plant, the first unit of which is not yet completed. Research on the staple process is being increased from laboratory-scale operations to pilot plant operations at the company's Waynesboro, Va., research laboratory.

The company's engineering department will handle construction of the staple unit, with sub-contracts for such specialties as job conditions warrant. The new building will be approximately 250 ft. by 1000 ft. of single and multiple-story construction.

• **A $1 million carbon bisulphide plant** will be built by Stauffer Chemical Co. at Lowland, Tenn. Expected to be completed this year, the plant will supply viscose rayon and cellophane manufacturers in the Southeast.

• **With operations beginning** at its new plant for medium chrome yellow pigment at Willow Island, American Cyanamid Co. now has at that location one of the largest installations in the U. S. for iron blue, chrome green, and the pigment which just went into production. The other two units were added in February, 1948, and October, 1949, respectively.

• **Production capacity** of Dow Chemical Co.'s Texas division is expected to be increased 10 per cent through new construction recently authorized by the company board of directors. Major lines to be extended are ethylene, chlorine, ethylene dichloride, vinyl chloride, perchlorethylene, synthetic magnesite and low-salt caustic. Work on some of the projects will begin immediately; all are scheduled for completion before 1952.

• **Carbide & Carbon Chemicals Division,** Union Carbide & Carbon Corp., has increased production of diisopropyl amine by adding new plant facilities, and has this material available in tank car or compartment car lots.

• **A plant reconstruction** and expansion program has been completed by Metalloy Corp., Minneapolis, Division of Lithium Corp. of America. Increasing industrial uses for lithium and partial damage to existing plant facilities by fire necessitated the work.

• **Production of vinyl film** has begun at General Tire & Rubber Co.'s Jeannette, Pa., plant. No commercial name has been given to the film, but it will be used in draperies, tea aprons, raincoats, etc. The company does not plan to enter the fabricating or conversion field but will expand facilities still further for production of vinyl-type leathers.

• **Philadelphia Quartz Co.** has opened a new research laboratory in Primos, Pa., near Philadelphia. It will be used for research on soluble silicates and development of new and improved products. The company's Philadelphia laboratory has been vacated.

• **American Aniline Products, Inc.** has constructed a new building providing warehouse facilities, general offices, and laboratories for its Charlotte branch at Charlotte, N. C. It will service textile centers in the South.

• **Westinghouse Electric Corp.** has started manufacturing operations at its new plant near Irwin, Pa. The plant will make an entirely new insulating product that has never before been manufactured by Westinghouse.

Washington

• **A new manual** to guide military departments, other government agencies and industry in coordinated planning for production of materials which would be needed for war has been issued by the Munitions Board. The guide, entitled "Production Allocation Manual", replaces the former Annex 47 manual. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 45 cents per copy.

Howard L. Sanders (left), treasurer of Commercial Solvents Corp.; named a vice president of the company; and Everett P. Partridge, director of research of Hall Laboratories, Inc., elected director of the company.

• **The organization meeting** of the National Technical Committee on Industrial Wastes was held recently in Washington, D. C., by representatives of 19 major industrial groups seeking solution of water pollution problems caused by industrial wastes. The Committee will draw up a program to solve such problems and to improve existing waste treatment methods where needed. It will be concerned only with technical matters and its activities will be closely related to the national stream improvement program authorized by the Water Pollution Act of 1948.

• **The U. S. Civil Service Commission,** Washington 25, D. C., has announced examinations for filling chemist, metallurgist and physicist positions at salaries ranging from $4,600 to $10,000 a year, and mathematician positions at salaries ranging from $3,825 to $10,000 a year. These positions are located in various Federal agencies in Washington, D. C., and vicinity.

• **The Office of Technical Services** has made 101 additional U. S. Government owned patent applications available for foreign filing. Sole purpose is to furnish U. S. manufacturers with an opportunity to contribute funds toward filing foreign applications in the Government's name. Foreign patents secured will eventually be licensed to American firms on a royalty-free, nonexclusive basis.

• **Technological information** uncovered in atomic energy research and of po-

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tential interest to American industry is being declassified on a fairly satisfactory basis according to preliminary conclusions of a technological working party searching the abstract file maintained by the Patent Branch of the Atomic Energy Commission. Members of the working party represented technical and engineering societies and the business press.

Ownership Changes

• **Reichhold Chemicals, Inc.,** has acquired Nobell Resins Co., Azusa, Calif. This will give Reichhold, which has a plant in San Francisco and Seattle, Wash., an advantageous site in the Los Angeles area and the only phenol plant on the West Coast.

• **Recent plans to merge** A. J. Wittenberg Corp. with Crown Oil Products Corp. were not consummated. The Wittenberg Co. will continue its activities independently as before at its new address, 29-27 41st Avenue, Long Island City, N. Y.

General

• **Attendance of about 500** at the first United States Technical Conference on Air Pollution held in Washington last month, gave concrete evidence of both industry and Government concern over the growing problem of atmosphere contamination. Some eighty papers presented during the three-day session dealt with causes and effects of such pollution and methods of abating it.

• **Three large syndicates** are applying for permits to build a natural gas pipeline from the Alberta gas fields to the Pacific Northwest. It could be in operation by 1954 if early approval by authorities is granted.

West Coast Transmission Co. would lay its pipe through Kamloops to Vancouver and then south through Tacoma. Northwest Natural Gas Co. and Prairie Transmission Lines propose crossing the Canadian border in Idaho, then through Spokane to Everett with lines running north and south from that point.

• **Chemical companies** report the following sales and earnings on past operations:

John D. Fennebresque (left), general manager of the chemical division of Celanese Corp. of America, presented the 1950 Award of the Yale Engineering Association for "advancement of basic and applied science"; and Robert H. Kittner, named production manager of Industrial Rayon Corp. Mr. Kittner has been vice president of the Chemical Division, The Glenn L. Martin Co.

• **A Government program** calling for procuring adequate feed-stocks—mainly styrene and butadiene—to reopen one of its rubber plants now in standby condition has been recommended by J. L. Collyer, chairman and president of the B. F. Goodrich Co. He cites present unstable conditions in the Far East upon which we depend for natural rubber and urges this action to bridge a gap in production should this form of rubber be cut off.

New Companies

• **The Chicago Research Group** has been formed in Chicago to undertake or assist in development and exploitation of chemical processes and products, primarily those of a patentable nature. Preference will be given developments in an advanced stage of development, but ideas in the embryonic state will be considered favorably if they seem sufficiently promising. The new organization is composed of Carl S. Miner, Miner Laboratories director; Hoy A. Cranston, Laboratory of Polarographic Analysis director; A. Sidney Behrman, consultant; and Franklin M. Warden, of the patent law firm of Cromwell, Greist and Warden.

• **Caldwell Chemical Co., Inc.,** New York, N. Y., has just been formed by John B. Caldwell, formerly vice-president and general manager of Merchants Chemical Co., Inc. The new company will sell and distribute industrial chemicals.

	Sales for the Quarter Ending March 31		*Net Income After Taxes Year Ending December*	
	1950	1949	1950	1949
Air Reduction Co.	$22,052,285	$23,632,290	$1,847,757	$1,817,430
American Potash & Chemical Corp.	3,919,000	3,530,000	544,739	391,413
Celanese Corp. of America	53,222,602	47,091,190	10,568,886	6,047,624
E. I. du Pont de Nemours & Co., Inc.	269,459,588	251,793,154	54,510,004	43,581,325
Minnesota Mining & Mfg. Co.	32,241,032	26,835,369	4,693,065	3,215,250
Sterling Drug, Inc., and subsidiaries	34,446,422	35,596,495	4,217,040	4,323,963
Texas Gulf Sulphur Co.	15,798,752	.....	6,407,279	.....
	Sales for Nine Months Ending March 31		*Net Income After Taxes Nine Months Ending March 31*	
	1950	1949	1950	1949
International Minerals & Chemical Corp.	$39,327,528	$39,026,242	$3,611,780	$4,135,734

Foreign Developments

• **A new company,** Forth Chemicals Ltd., has been formed by British Petroleum Chemicals Ltd. and Monsanto Chemicals to manufacture monomeric styrene at Grangemouth, Scotland. This is an outgrowth of the expanded refinery industry in Scotland where British Petroleum Chemicals Ltd., a company jointly owned by Anglo-Iranian and Distillers Co. Ltd., is interested in developing a petrochemicals industry.

• **German trade unions** in the chemical industry are requesting Allied authorities to decartelize IG Farben. They suggest formation of a liquidation agency to settle with former stockholders and specify a trustee organization to propose and carry out reorganization plans to the High Commissioners.

Company Notes

• **To increase lay knowledge** of the potash industry, International Minerals & Chemical Corp. recently was host to a diversified group of American businessmen on an inspection tour of its potash mining and refining operations at Carlsbad, N. M.

• **Panray Corp., New York,** has established a chemical research and consultation division under the directorship of Milton Feier. It will specialize in solution of production problems and new product development.

• **The first Phillips 66** pelleted ammonium nitrate made in new facilities adjacent to Cactus Ammonia Plant in the Texas Panhandle was shipped recently. Output of ammonium nitrate fertilizer solids and solutions is approaching design capacity rate of 100,000 tons per year.

• **Fairmount Chemical Co., Inc.,** Newark, N. J., has appointed DeLamar-Hendrey Chemical Co., Inc., Chicago, Ill., as its Mid-Western sales representative.

• **American Cyanamid Co.** has formed a Dyes and Chemicals Export Department to handle foreign activities in connection with its Calco Chemical Div. (except pharmaceuticals), Industrial Chemicals Div., and Plastics and Resins Div.

• **C. F. Boehringer & Soehne,** G.m.b.H. of Mannheim, Germany, U. S. Zone, pharmaceutical manufacturer, has appointed the Mann Fritzsching Corp., New York, N. Y., its exclusive sales agent for the U. S. and Canada.

• **Lion Oil Co.** attributes the 67% increase in earnings for the first quarter of 1950 over that of 1949 ($3,709,526 compared with $2,222,779) to substantially increased production of crude oil and from increased volume in chemical operations made possible by completion in 1949 of a large-scale construction program.

• **Continental Carbon Co.,** in collaboration with Witco Carbon Co., has opened a Houston, Tex., office in the M and M Building.

• **The Quaker Oats Co.** has moved its Chicago general office to The Merchandise Mart, Merchandise Mart Plaza, Chicago 54, Ill.

• **Chicago district office** of the Petroleum Chemicals Division of Du Pont has moved to the Willoughby Tower, 8 South Michigan Blvd., Chicago 3, Ill.

• **New location** of The Northwestern Chemical Co. is 120 N. Aurora St., West Chicago, Ill.

• **Process Industries Engineers, Inc.,** Pittsburgh, has formed a manufacturing division to fabricate specially engineered equipment for the chemical, petroleum, food and allied industries.

• **Richmond Chemical Corp.** has moved to larger quarters at 1741 Richmond Terrace, Staten Island, N. Y.

• **Funds for a graduate fellowship** in chemistry have been given to Stanford

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CALENDAR *of* EVENTS

AMERICAN CHEMICAL SOCIETY, 118th national meeting, Chicago, Sept. 3-8.
AMERICAN SOCIETY FOR TESTING MATERIALS, 53rd annual meeting, Atlantic City, June 26.
CHEMICAL INSTITUTE OF CANADA, annual meeting, Royal York Hotel, Toronto, Ont., June 19-22.
FOREST PRODUCTS RESEARCH SOCIETY, annual convention, Portland, Oregon, June 25-29.
INSTRUMENT SOCIETY OF AMERICA, fifth national instrument exhibit, Memorial Auditorium, Buffalo, N. Y. Sept. 18-22.
MANUFACTURING CHEMISTS ASSOCIATION, annual meeting, Hotel Monmouth, Springlake, N. J., June 19-20.
NATIONAL CHEMICAL EXPOSITION, Chicago Coliseum, Chicago, Sept. 5-9.
NEW ENGLAND INDUSTRIAL WASTES CONFERENCE, Massachusetts Institute of Technology, Cambridge, Mass., June 26-28.
THIRD WESTERN PACKING EXPOSITION, San Francisco Civic Auditorium, San Francisco, Aug. 14-16.

F. H. Leonhardt (right), president of Fritzsche Brothers, Inc., with (l. to r.) technical director-vice president Ernest Guenther, vice president John H. Montgomery and Arie Jan Haagen-Smit of Calif. Institute of Technology, recent winner of the $1000 Fritzsche Award. This award, administered by the American Chemical Society, is awarded annually for outstanding achievement in the field of essential oils and related chemicals.

PERSONNEL

Company Officers

• Martin Adler has been elected president and Mr. P. C. Hereld, executive vice-president of **Chemo Puro Manufacturing Corp.** Dr. Adler, who was formerly vice-president, takes the place of the late Hugo Bamberger.

• L. W. Huber has retired from the **L. W. Huber Co.** due to ill health. He founded the business in 1926.

Production

• James R. Patterson has been appointed West Coast manager of the Chemicals Division of **General Electric's** Chemical Department. He will have charge of engineering, manufacturing, and sales of division products on the West Coast and in the intermountain states.

• W. A. Karre has been appointed general superintendent of the Niagara Falls operations of **Mathieson Chemical Corp.**

• C. H. Madsen has been named assistant to the operations manager, synthetic rubber division, **United States**

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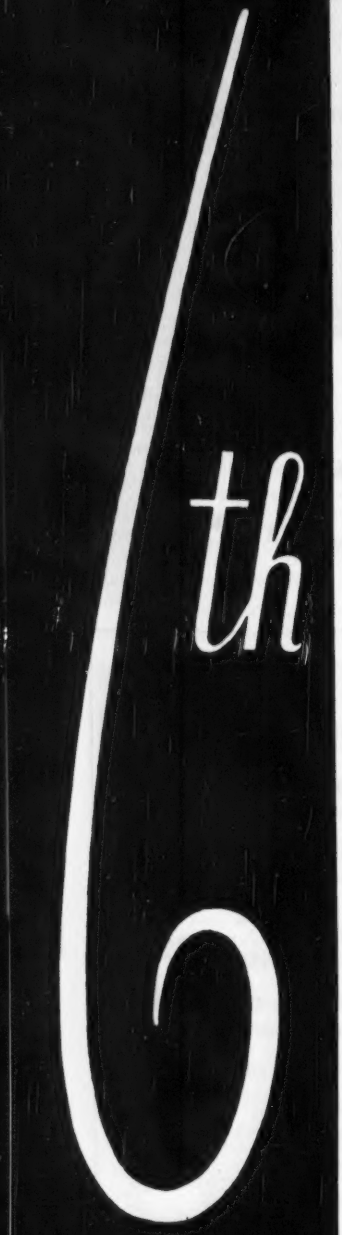

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Rubber Co. He has been factory manager of the Borger, Texas, plant.

• Albert D. Wagen has been named Pacific Coast divisional director for **Pittsburgh Plate Glass Co.'s** paint division. He succeeds Louis F. Theurer who has retired after 31 years' service.

Sales

• G. S. Berge has been appointed sales development supervisor for silicone rubber and J. A. Buckley has been appointed to the same position for extruded plastics products for the **General Electric Co.'s** Chemical Department.

• Leland A. Doan has been appointed assistant sales manager of the Great Western Division, **The Dow Chemical Co.** Joining Dow in 1941 as a member of the San Francisco office, Mr. Doan transferred to the styrene division, Los Angeles, a year later, and he has been manager of the company's Los Angeles office since 1945.

• **Hercules Powder Co.** has announced a special assignment in the Sales Research Division for Henry N. Marsh, formerly manager of the Explosives Department's Smokeless Powder Division. Frederick M. Hakenjos has been appointed to the newly created post of manager of Smokeless Powder Sales.

Research

• Maurice L. Ernsberger has been appointed assistant director of the Pioneering Research Section of the **Du Pont Co.'s** Rayon Department. He has been a research supervisor in the company's Chemical Department.

• Howard K. Nason, director of the Central Research Department, **Monsanto Chemical Co.,** has been appointed assistant to C. A. Hochwalt, vice president and co-ordinator of research, development and patent activities of the company.

Nicholas N. T. Samaras, director of the company's Plastics Division research department, was named successor to Mr. Nason as director of the Central Research Department.

Associations

• **The American Institute of Chemists** has elected the following officers to serve for two year terms until 1952: President (re-elected), Lawrence H. Flett, director, New Products Division, National Aniline Division, Allied Chemical & Dye Corp.; president-elect, Lincoln T. Work, consultant; secretary (re-elected), Lloyd Van Doren, chemical consultant, patent causes, Watson Bristol, Johnson & Leavenworth; treasurer (re-elected), Frederick A. Hessel, president, Montclair Research Corp.

• Election of officers for 1950-51 is announced by the **American Oil Chemists' Society** as follows: President, John R. Mays, Jr., Barrow-Agee Laboratories Inc.; vice president, A. E. Bailey, Girdler Corp.; secretary, H. L. Roschen, Swift and Co.; and treasurer, J. J. Vollertsen, retired from Armour and Co.

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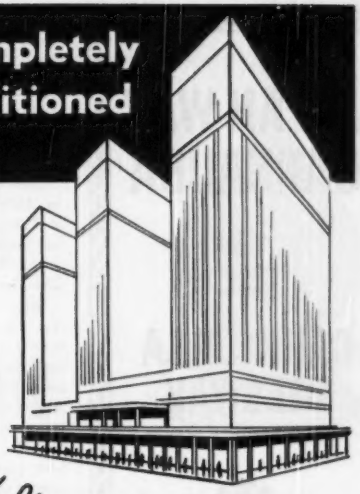

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CHEMICAL MARKETS

Soap Sales Pick Up In First Quarter

Domestic soap sales for the first quarter 1950 increased over fourth quarter of 1949 but were slightly under sales for the first quarter of 1949 according to the Association of American Soap & Glycerine Producers, Inc.

Sales census reports to the Association from 80 manufacturers representing a very substantial portion of the industry's volume show non-liquid soap sales amounting to 586,734,000 pounds through March 31, 1950. Based on only those company reports which make comparisons possible, non-liquid soap sales for the first quarter 1950 were 5.5 per cent less than for the first quarter of 1949 but were 21.4 per cent above the fourth quarter 1949.

Liquid soap sold during the first quarter 1950 amounted to 1,225,000 gallons. Comparative reports indicate a 12.6 per cent decrease from the fourth quarter 1949 and .2 per cent decrease from the first quarter 1949.

Sales of synthetic detergents in the first quarter of 1950 as reported by 32 companies totaled 263,874,000 pounds. In the fourth quarter of 1949, 37 companies reported 181,323,000 pounds, and for the first quarter of 1949, 27 manufacturers reported sales totaling 162,211,000 pounds.

Ti Pigments Tight

A tight market in titanium pigments has resulted from a heavy demand for these materials brought on by continued increases in paint sales. For some time producers have been filling orders out of stocks since those received have been in excess of capacity, and one producer has placed customers on an allocation basis. Producers, however, believe that deliveries this year have exceeded consumption despite figures showing a greater gallonage of paint sold. The National Paint, Varnish and Lacquer Association, which points out these facts, has joined pigment producers in asking the paint industry not to accumulate excessive inventories, and to work out requirements with their suppliers. It expresses confidence that paint manufacturers will be able to obtain as much or more than they purchased last year.

Potash Deliveries Reflect Earlier Strike

A total of 422,490 tons of potash salts containing an equivalent of 240,569 tons of K_2O was delivered during the first quarter of 1950 by the five major American producers, according to the American Potash Institute. This represents a decrease of 25% in salts and 18% in K_2O under the corresponding period in 1949, due to the strike at the mines in the Carlsbad, N. M., area during January. Deliveries for agricultural purposes in the United States, Canada, Cuba, Puerto Rico, and Hawaii consisted of 384,452 tons of potash salts equivalent to 217,102 tons of K_2O as compared to 272,713 tons K_2O in the first three months of 1949. Muriate of potash predominated with 199,485 tons K_2O whereas 16,915 tons were delivered as sulphate of potash and sulphate of potash magnesia, and 702 tons as manure salts. Deliveries for chemical purposes totaled 29,982 tons of salts equivalent to 18,632 tons K_2O, an increase of 8% over the corresponding period a year earlier. Exports to other than Institute countries amounted to 8,056 tons of potash salts containing 4,835 tons K_2O, an increase of 55% K_2O over 1949.

Limited Pesticide Market In U.K., India, Burma

Reports to the Office of International Trade from U. S. Embassy staff members in London, England; New Delhi, India; and Rangoon, Burma, indicate that there are not very promising prospects for United States insecticide manufacturers interested in selling their products in those countries.

The United Kingdom not only is self-sufficient in pest control products, according to the OIT in its *World Trade in Commodities* for April 1950, but supplies an important export market. That area is not an important market for U. S. pesticides, and, with the present dollar shortage, there is little likelihood of expansion.

The new pest control products are not manufactured in India and Burma, although some basic chemicals required for such production are available in India, principal supplier of which is the United Kingdom. Imports from dollar areas are prohibited, although specialized pesticides from the U. S. are needed for particular types of control.

It is suggested that U. S. firms could improve Indian markets by having the Ministry of Agriculture conduct experiments with their products, particularly specialized commodities which cannot be obtained from sterling areas. If the Ministry should decide the U. S. product is superior for a particular type of control, a greater market might be established, even under rigorous exchange conditions. Establishment of a U. S. market in Burma would require considerable expense.

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Superphosphate Registers Production Gains

Domestic production of superphosphate in March 1950 totaled 913,952 short tons for normal, 61,267 tons for concentrated and 4,512 tons for wet-base goods, according to the Bureau of the Census. A production gain over March 1949 of 46 per cent was reported for concentrated superphosphate, while the March 1950 totals for each of the three grades are higher than those for the previous month.

March shipments were also greater than those for the previous month. Almost twice as much concentrated superphosphate was shipped in this month as for the corresponding period of last year. Stocks on hand for normal superphosphate declined 22 per cent during the month; concentrated, 25 per cent; and wet-base goods, 32 per cent. However, wet-base goods inventories at 11,964 tons still were 125 per cent higher than the quantities on hand at the end of March 1949.

These figures are based on the reports of 191 plants (revised count), 6 of which produce concentrated superphosphate exclusively. Of these, 185 reported the manufacture of normal superphosphate; 10, concentrated superphosphate; and 6, wet-base goods.

Market Review

Continuation of the shortage of two basic chemicals—benzol and chlorine—and the rising trend of chemicals derived from non-ferrous metals were among the more significant aspects of chemical markets. The short railway strike west of Buffalo and Harrisburg hurt deliveries of benzol and important chemicals derived from it, and prospects for chlorine were worse with the advent of summer and the demand for water treatment.

Of great importance was the announcement by Solvay Sales Division, Allied Chemical & Dye Corp. of an increase of 10¢ per 100 pounds on soda ash and 15¢ per 100 pounds on chlorine and caustic soda in all forms, effective July 1. Among the new prices are the following (per 100 pounds): 58% light soda ash in bulk, carloads, $1.10; 58% dense soda ash in bulk, carloads, $1.20; 76% solid caustic soda, drums, carloads, $3.20; 76% flake, ground or powdered caustic soda, drums, carloads, $3.60; 50% liquid caustic soda, seller's tank cars, basis 76%, $2.55; 50% liquid caustic soda, rayon grade, seller's tank cars, basis 76%, $2.65; 70-74% liquid caustic soda, seller's tank cars, basis 76%, $2.65; 70-74% liquid caustic soda, rayon grade, seller's tank cars, basis 76%, $2.75; liquid chlorine, single unit tank cars, $2.55.

Following an advance in copper, copper sulfate was increased 35¢ per cwt. to $7.35-8.35, depending upon quantity, and copper chloride moved to 18½¢ a pound in 400-pound drums, f.o.b. works, a ½¢ increase. A ¾¢-a-pound increase in copper hydrate, and a 1¼¢ increase in the technical nitrate crystals, established their prices at 25½¢-26¢ and 23½¢ a pound, respectively, works. Copper carbonate was higher, with the light fluffy or dark dense green, 55% metallic copper, at $19.20 per 100 pounds, carlots.

The long position of ammonium sulfate was dramatically acknowledged with a one-third slash in the price of the coke oven material. Producers dropped the price from $45 a ton to $32-37, f.o.b. ovens. In sharp contrast to this condition was the very tight picture in pesticides on the formulator level. Benzene hexachloride and DDT in particular were almost impossible to get.

As prices on zinc slab and pig lead continued to mount, users of pigments found their costs continually rising. After a series of advances, latest prices on such pigments stood as follows: dry red lead, 14¾¢; litharge, 13¾¢; orange mineral, 18.10¢; white lead, basic carbonate, 14½¢; white lead, basic silicate, 14¾¢; red lead in oil, 28¢; white lead in oil, 26¢; and for zinc oxide: dom. acicular, 12¼-12¾¢; Amer. Proc. lead free, 12¼¢-12¾¢; leaded 5%, 12¼¢; leaded 35%, 12⅛¢; leaded 50%, 12½¢; French proc. lead free, 14½¢; green seal, 14¢; red seal, 13½¢; and white seal, 14½¢, all prices per pound, carlots, delivered.

Although most coaltar chemicals were tight, there were no price changes with the exception of a 5¢-a-gallon boost for imported cresylic acid, putting it in the 52½-57½ range, c.i.f. New York. Both petroleum xylol and toluol were advanced 1¢ a gallon at some locations, establishing a Baytown, Tex., tankcar price of 26¢ for both. The increased cost of gasoline also resulted in a ½¢-a-gallon raise in the East Coast price of a long list of aliphatic derivatives.

Reductions were the rule for many drug items. Chloromycetin was reduced 25% by Parke, Davis & Co.; terramycin, 28.6% by Chas. Pfizer & Co. to about $2.15 a gram; para-aminosalicylic acid and its sodium salt were cut $1 and 75¢ a pound to $5.50 and $5.25, respectively, for 1,000 lb. lots; aureomycin capsules were cut another 25%; sulphanilamide was reduced 25¢ to $1.05 a pound in 1,000 lb. lots; Cortisone went from $135 a gram to $110; and ACTH, from $210 to $100 a gram.

Other price developments saw Shell Chemical Co. reduce ditertiary butyl peroxide from $3 to $2 a pound; dextrines advanced 10¢ a cwt. to set gum at $7.30, canary at $7.04 and white at $6.89; beta-naphthol be reduced from 30¢ to 28½¢; amyl acetate go up 3¢ to 18¢ a pound for commercial grade in tankcars; and silver nitrate and cyanide advance to 46½¢ and 66½¢ an ounce in lots of 2,500 ounces, respectively. The carnauba wax market, previously weakened by "barter wax", showed firmness in the absence of offerings from Brazil as these prices were established: No. 1 yellow, 87¢; No. 3 NC, 66¢; and refined, 71¢.

TREE TAPPING

GUMS *Chemicals and Drugs*

(CRUDE, POWDERED)

GUMS:

GUM ARABIC
GUM ARABIC (Bleached)
GUM GHATTI
GUM KARAYA (Indian)
GUM TRAGACANTH
GUM EGYPTIAN
GUM LOCUST (Carob Flour)
QUINCE SEED
★
CASEIN

SPECIALTIES:

MENTHOL (Crystals)
★
TEA SEED OIL
★
EGG ALBUMEN
EGG YOLK
BLOOD ALBUMEN
JAPAN WAX
CANDELILLA WAX

PAUL A. DUNKEL & CO., *Inc.*

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Abstracts of United States Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

U.S. Patents from Official Gazette—Vol. 630, Nos. 4, 5 (Jan. 24-31) and Vol. 631, No. 1 (Feb. 7)

Organic

Production of finely divided, stable dispersions of the high molecular reaction products obtained by reacting a di-halogen substituted paraffin with an alkaline polysulfide which comprises executing said reaction in a aqueous medium in the presence of a dispersion agent consisting essentially of a water soluble salt of a sulfuric acid ester of a monohydric aliphatic alcohol. 2,496,226. Shell Development Co.

Production of finely divided, highly concentrated, stable dispersions of the high molecular weight reaction products o tained by the interaction of a dichlor-substituted paraffin with an alkaline polysulfide in an aqueous medium in the presence of a dispersing agent, which comprises adding an inorganic electrolyte providing a multi-valent cation, effecting the flocculation with separation of a supernatant layer comprising aqueous salt solution from a bottom layer comprising flocculated high molecular weight reaction products. 2,496,227. Shell Development Co.

In producing secondary monohydric alcohols from aliphatic normal monoolefins by contacting a hydrocarbon stream containing normal olefins and tertiary olefins with a strong mineral acid to form an acid extract phase which extract is su bsequently hydrolyzed and secondary monohydric aliphatic alcohol recovered, the improvement which comprises adding to the hydrocarbon stream a hydrocarbon solution of the dialkyl ester of the normal olefin and the mineral acid containing traces of strong mineral acid prior to introduction of the hydrocarbon stream into the absorption zone. 2,496,251. Standard Oil Development Co.

Production of xylenes. 2,496,253. Shell Development Co.

Monomeric polymerizable ester of an alcohol of the class consisting of allyl and methallyl alcohols and a Diels-Alder condensation compound of the type obtained by reacting a compound of the class consisting of maleic acid, maleic anhydride and lower alkyl esters of maleic acid and a conjugated monocyclic terpene. 2,496,271. Sherwin-Williams Co.

2-picoline sulfur condensation products. 2,496,319. Koppers Co., Inc.

Catalytically hydrogenating a lower alkyl (beta-cyanoalkyl)-(lower acyl)-aminomalonate in the presence of a metal catalyst, thereby forming a 2-piperidone derivative. 2,496,326. Winthrop-Stearns Inc.

Producing polyhydric alcohol esters of fatty acids having a high monoester content by heating one fatty material from the group consisting of fatty acids and fatty acid esters with 4 to 10 molar proportions of polyhydric alcohol, agitating to form an intimate dispersion of said alcohol and fatty materials, cooling and permitting the cooled product while still liquid to separate into an ester layer and a substantially pure layer of polyhydric alcohol. 2,496,328. Colgate-Palmolive-Peet Co.

Dialkyl silane derivative of ricinoleic acid ester which is a useful plasticizer for nitrocellulose. 2,496,335. U. S. Industrial Chemicals, Inc.

Trialkyl silane derivative of ricinoleic acid ester which is a useful plasticizer for nitrocellulose. 2,496,340. U. S. Industrial Chemicals, Inc.

3-sulfanilamido-benzotriazines-1,2,4. 2,496,364. Merck & Co., Inc.

Heating a mixture of *a*-amino-*β*-methoxyisovaleric acid, acetic anhydride, and triethylamine, to crystallize 2-methyl-4-isopropylidene-5(4)-oxazolone. 2,496,417. Merck & Co., Inc.

Producing cyclopropane by contacting $RaSi(CH_3)_3X$, in which each R represents a substituent of the group consisting of alkyl and monocyclic aryl and X represents a substituent of the group consisting of chlorine and bromine, with an aluminum halide, with the formation of RaSiX and cyclopropane. 2,496,419. Dow Corning Corp.

Sulfurized oleaginous compound stabilized with an aliphatic epoxide. 2,496,508. Standard Oil Co.

Concentrating polyalkylene oxide condensation products by contacting with a solid adsorbent. 2,496,582. General Aniline & Film Corp.

Hydrating olefins with a hydration catalyst comprising a silica support upon which is distended a catalytic agent of the group consisting of at least one of the oxygen containing acids of phosphorus and mixtures of the oxygen containing acids and metal salts of phosphorus. 2,496,621. Union Oil Co. of Calif.

Esters of hydroxyalkyl aromatic sulfonamides. 2,496,650. General Mills, Inc.

Esters of hydroxyalkyl aromatic sulfonamides. 2,496,651. General Mills, Inc.

Production of nitriles by contacting an olefinic hydrocarbon with ammonia, in the presence of a metal salt selected from the group consisting of the metal salts of molybdic acid and the metal salts of tungstic acid. 2,496,659. Socony-Vacuum Oil Co., Inc.

Manufacturing aromatic nitriles, by contacting an aromatic hydrocarbon selected from the class consisting of toluene, the xylenes, the trimethyl benzenes and styrene, with ammonia, in the presence of a metal salt of molybdic acid. 2,496,660. Socony-Vacuum Oil Co., Inc.

Production of nitriles. 2,496,661. Socony-Vacuum Oil Co., Inc.

Dihydroxypropyl ether of a gum selected from the group consisting of glucomannan and galactomannan gums. 2,496,670. General Mills, Inc.

2-methyl-4-keto-1,3-benzothioxane. 2,496,741. Monsanto Chemical Co.

Preparation of acetylanisole wherein acetic anhydride is reacted with anisole in the presence of perchloric acid. 2,496,786. E. I. du Pont de Nemours & Co.

Forming unsaturated acid esters. 2,496,791. Eastman Kodak Co.

In production of veratraldehyde, melting vanillin in water, adjusting pH with sodium hydroxide, adding sodium hydroxide and dimethyl sulfate, upon completion of methylation acidifying the system, and separating veratraldehyde from the aqueous layer. 2,496,803. E. I. du Pont de Nemours & Co.

Preparing 3-vinylpyrene by passing 3-(alpha-hydroxyethyl) pyrene over activated alumina. 2,496,867. General Electric Co.

$C_{18}H_{34}$-O-C_2H_4-O-C_2H_4-OOC,CH_2O-C_2H_4-N(C_2H_4OH)$_2$. 2,496,875. Emulsol Corp.

N-aroyl alanine amides. 2,496,882. J. R. Geigy A. G.

As an improvement in the manufacture of anthroquinone from phthalic anhydride and benzene by the Friedel-Crafts method wherein all reactions are effected under anhydrous conditions, the improved process which comprises reacting phthalic anhydride with benzene and aluminum chloride under anhydrous conditions while mechanically agitating the reaction mixture to form a chemical complex of aluminum chloride and o-benzoyl benzoic acid, and then converting the said dry complex into anthraquinone with oleum while mechanically agitating the reaction mixture. 2,496,894. American Cyanamid Co.

N-(di-substituted thiocarbamylthio-methylene) aromatic amines. 2,496,941. Wingfoot Corp.

1-alkyl-4-pyrrolidinoethylamino-piperidines. 2,496,955. Upjohn Co.

1-alkyl-4-(beta-hydroxyethylamino)-piperidines. 2,496,956. Upjohn Co.

1-alkyl-(N-benzyl-N-alphapyridylamino)-piperidines. 2,496,957. Upjohn Co.

1-alkyl-benzylaminopiperidines. 2,496,958. Upjohn Co.

Producing 4,4'-diketodicyclohexyl by dehydrogenating 4,4'-dihydroxydicyclohexyl dissolved in phenyl ether in the presence of copper chromite. 2,496,960. Wingfoot Corp.

Alpha:beta:2:2'-tetramethyl-4:4'-dihydroxystilbene. 2,496,968. Burrougha Wellcome & Co. (U.S.A.) Inc.

Production of hydrocyanic acid by catalytic reaction in the vapor phase of gaseous ammonia, oxygen and a hydrocarbon. 2,496,999. American Cyanamid Co.

Electrochemical preparation of *a*-amino-n-butyric acid and N-benzoyl derivative. 2,497,024. John H. Billman.

Paper & Pulp

In the continuous smelting process of recovering chemical from the black liquor derived in pulp mills from digesting the cellulose with white liquor, the step of controlling the sulphidity of the white liquor o tained from the smelt by substantially continuously introducing coke in particle form into the black liquor prior to the introduction of such black liquor into the furnace. 2,495,248. Combustion Engineering-Superheater Inc.

Kraft paper sheet having at least one side coated with a vapor resistant film of asphalt mineral rubber of, a coumarone indene resin, a rosin plasticizer selected from the group consisting of methyl ester of rosin and hydrogenated methyl ester of rosin, paraffin wax, and copper naphthenate as a fungicide. 2,496,566. Alexander Szwarc.

Petroleum

Mineral oil fraction containing an oil-soluble, metal salt of an acidic, phosphorus-and sulfur-containing reaction product obtained by reaction of a phosphorus sulfide and an amine selected from the group consisting of an alkyl-nuclear-substituted primary and secondary aromatic amine and an alkyl-N-substituted secondary aromatic amine. 2,495,478. Socony-Vacuum Oil Co., Inc.

Diesel fuel comprising a hydrocarbon Diesel and a sulfurized cracked petroleum distillate. 2,495,555. Gulf Research & Development Co.

Contacting a mixture of a straight chain olefin and an isomeric branched chain olefin having from 4 to 6 carbon atoms with a cracking catalyst of the group consisting of silica-alumina, silica-magnesia, silica-zirconia-alumina and alumina-boria and the activated clay catalysts to selectively convert branched chain olefins to the corresponding isoparaffin, and recovering the straight chain olefin. 2,495,648. Shell Development Co.

Lubricating grease comprising a mineral lubricating oil and an alkali metal soap of a fatty acid. 2,495,651. Socony-Vacuum Oil Co., Inc.

Silica-alumina-nickel hydrocarbon dehydrogenation catalyst. 2,495,700. Koppers Co., Inc.

Liquid phase cracking of hydrocarbons with water-saturated catalysts. 2,495,723. Houdry Process Corp.

Conversion of hydrocarbons with modified clay catalysts. 2,495,751. Houdry Process Corp.

Extracting aromatic hydrocarbons from a mixture comprising normally liquid aromatic and non-aromatic hydrocarbons by extracting with a complex of boron fluoride with an oxygenated alkane compound having not more than about 5 carbon atoms in the alkyl group. 2,495,850. Standard Oil Co.

Desulfurizing a sulfur-bearing hydrocarbon material comprising extracting said hydrocarbon material with a solvent comprising essentially a complex of boron fluoride with an oxygenated alkane compound having not more than about 5 carbon atoms in the alkyl group. 2,495,851. Standard Oil Co.

Production of normally liquid hydrocarbons by reacting carbon monoxide and hydrogen in the presence of a fluidized mass of subdivided catalyst comprising essentially a metal of the eighth group of the periodic system and promotional amounts of a difficultly reducible metal oxide, both constituents being associated with a carrier comprising silica gel. 2,496,265. Standard Oil Development Co.

Reforming a gas consisting of methane by contacting with CO_2 in the presence of a catalyst comprising copper carried on activated carbon to effect conversion of the reactants into hydrogen and carbon monoxide. 2,496,342. Standard Oil Development Co.

Producing valuable conversion products from CO and H_2 in the presence of iron catalysts by contacting with a fluidized mass of sintered reduced iron oxide particles of fluidizable size obtained by incorporating into red-iron oxide powder a minor amount of potassium carbonate. 2,496,343. Standard Oil Development Co.

Reducing the sulfur content of crude and cracked petroleum distillates by introducing the vapor of an organic carboxylic acid at the bottom of a column consisting essentially of pieces of copper to form a layer of copper soap, directing the distillate in the vapor phase through the layer thereby fixing the sulfur on the copper. 2,496,536. Air Reduction Co., Inc.

Rust-inhibiting lubricating composition consisting of an oleaginous liquid and a tertiary dodecyl thiosuccinic acid. 2,496,798. Texas Co.

Composition useful as a gum inhibitor for motor fuels consisting of a mixture of N,N'-diisopropyl-p-phenylenediamine and aniline. 2,496,930. Eastman Kodak Co.

Antiknock composition consisting of lead alkyl antiknock compound and a

scavenger a principal active scavenging ingredient of which is a halogenated ether. 2,496,983. Ethyl Corp.

Photographic

Diazotype photoprinting material stabilized with an α-alkylidene-polymethylene dicarboxylic acid. 2,495,827. General Aniline & Film Corp.

Poly-N-vinyl lactam photographic silver halide emulsions. 2,495,918. E. I. du Pont de Nemours & Co.

Diazotype aqueous coating solution for plastic carriers of the class consisting of regenerated cellulose, cellulose esters, and cellulose ethers comprising a light sensitive diazo compound and an aliphatic halohydrin of the class consisting of ethylene chlorhydrin, and propylene chlorhydrin. 2,496,196. General Aniline & Film Corp.

Photoprinting materials comprising light sensitive layers on a suitable base containing a diazo compound suitable for forming a stable two-components diazo-type layer, an azo dye coupling component and a member of the class consisting of sulfo amino benzoic acids and their N-substituted derivatives. 2,496,240. General Aniline & Film Corp.

Photographic filter and antihalation layers containing a silver salt of an azanol dye. 2,496,841. General Aniline & Film Corp.

Photographic elements containing hydroxy heavy metal salts of trinuclear imnol cyanine dyes as filter and antihalation dyes. 2,496,843. General Aniline & Film Corp.

Photographic developer containing a negatively substituted aralkylamine and process of development. 2,496,903. General Aniline & Film Corp.

Polymers

Polymeric polyamine which is the reaction product of the reductive-amination of a polymer of a monoolefin containing from 2 to 4 carbon atoms with carbon monoxide. 2,495,255. E. I. du Pont de Nemours & Co.

Thermosetting composition which comprises a mixture of formaldehyde and the product obtained by heating a solution containing a monoolefin/carbon monoxide polymer and furfural. 2,495,282. E. I. du Pont de Nemours & Co.

Composition comprising a wax and a polymeric polyamine. 2,495,283. E. I. du Pont de Nemours & Co.

Polycyanohydrin made by reacting hydrogen cyanide with a monoolefin/caroon monoxide polymer. 2,495,284. E. I. du Pont de Nemours & Co.

Preparation of polymerization products by heating carbon monoxide with a polymerizable organic compound containing ethylenic unsaturation in the presence of a per-oxy compound catalyst, and in the absence of a Friedel-Crafts catalyst. 2,495,286. E. I. du Pont de Nemours & Co.

Hydrogenation of carbon monoxide-monoolefin polymers in the presence of a hydrogenation catalyst to secondary alcohols. 2,495,292. E. I. du Pont de Nemours & Co.

Polymeric polythiol which is the reaction product of the reductive-thiolation with hydrogen and hydrogen sulfide of a polymer of carbon monoxide and a monoolefin containing from 2 to 4 caroon atoms. 2,495,293. E. I. du Pont de Nemours & Co.

Copolymeric siloxanes. 2,495,362. Dow Corning Corp.

Ethylmethylpolysiloxanes. 2,495,363. Dow Corning Corp.

Interpolymer produced from polyhydric alcohol, polybasic acid, and interpolymer of vinylaromatic compound with drying oil or acid. 2,495,458. Arco Co.

Resinous condensation products from an aldehyde or a ketone and an N-alkenylarylamine. 2,495,890. Universal Products Co.

Copolymer of acrylonitrile and vinyl acetate dissolved in acetonitrile. 2,496,267. American Viscose Corp.

Copolymer of the vinyl ester of maleamic acid and vinyl acetate. 2,496,275. Eastman Kodak Co.

Treating peroxide contaminated olefinic hydrocarbons having 8 to 24 carbon atoms with a reducing agent to destroy the peroxides, distilling and heating said distillate while still peroxide-free with maleic anhydride in an inert atmosphere whereby simple condensation products are produced. 2,496,358. Colgate-Palmolive-Peet Co.

Emulsion polymerization process for vinyl compounds. 2,496,384. Shell Development Co.

Flexible, jelly-like composition comprising a material selected from the group consisting of the synthetic resin ethyl and methyl methacrylate resin and polyvinyl resin and the plastic cellulose acetate, and a polyethylene glycol acetate plasticizer. 2,496,387. Arthur Fink.

Cyclic ether peroxide catalysts in the polymerization of conjugated diolefins. 2,496,390. Les Usines de Melle.

Polyvinyl acetal resins of improved stability. 2,496,480. Shawinigan Resins Corp.

Continuous bulk polymerization of styrene. 2,496,653. Union Carbide and Carbon Corp.

Copolymerization of thiophene with styrene by contacting in the presence of hydrogen fluoride. 2,496,669. Socony-Vacuum Oil Co., Inc.

Styrene-substituted benzalaceto-phenone copolymers. 2,496,697. Monsanto Chemical Co.

Vinyl halide resins plasticized with a dioctyl tetrachlorophthalate. 2,496,852. General Electric Co.

Polymers of 3-vinylpyrene. 2,496,868. General Electric Co.

Preparing concentrated dispersions of solid polymers of ethylene by dissolving in a water-immiscible volatile organic solvent, emulsifying in the presence of an emulsifying agent and a proteinaceous protective colloid removing the solvent, acidifying, mechanically separating water and reconstituting the dispersion by adjusting the pH. 2,496,907. I.C.I. Ltd.

Linear polyesters of hydroquinone, saturated glycols and dicarboxylic acids and their preparation. 2,496,933. Eastman Kodak Co.

Copolymers comprising terpinyl methacrylate interpolymerized with butadiene-1,3. 2,496,935. Wingfoot Corp.

Transparent wrapping films of 2,3-dichlorobutadiene copolymers. 2,496,976. E. I. du Pont de Nemours & Co.

Normally hard, friable polytetrafluorethylene wax consisting of pyrolized tetrafluoroethylene polymers. 2,496,978. E. I. du Pont de Nemours & Co.

Aqueous dispersion of ethylene polymers containing a salt of a polymeric amic acid. 2,496,989. E. I. du Pont de Nemours & Co.

Resin dispersion comprising a solid thermoplastic vinyl resin dispersed in a petroleum hydrocarbon oil. 2,497,045. Socony-Vacuum Oil Co., Inc.

Fluorinating a synthetic aliphatic high-molecular-weight polymer of a halogenated ethylene monomer. 2,497,046. American Cyanamid Co.

Granular, water-insoluble synthetic resinous material for exchanging cations in liquid media and obtained by a reaction between 4,4'-dihydroxydiphenyl sulfone, formaldehyde and an alkaline sulfiting agent by heating. 2,497,054. American Cyanamid Co.

Specialties

Extrudable cork composition which comprises cork particles, a binder

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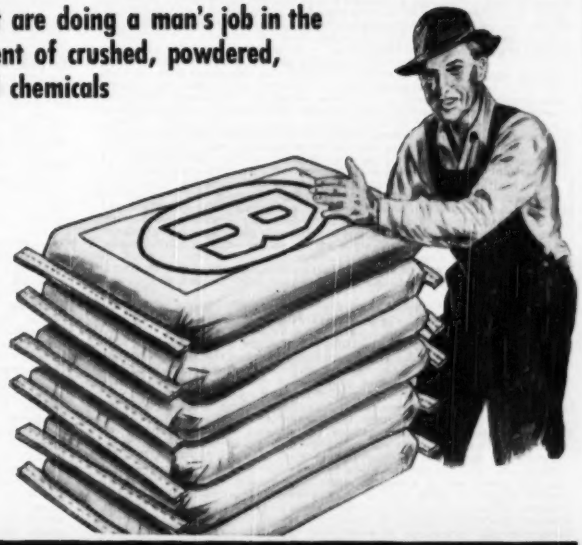

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therefor, and a lubricant coating the cork particles, said lubricant including a mixture of hydrogenated cottonseed oils and a bodying agent for the oils consisting of a thermoplastic methacrylate resin. 2,495,277. Armstrong Cork Co.

Composition comprising a wax and a polymeric polyketone obtained by polymerizing ethylene with carbon monoxide. 2,495,285. E. I. du Pont de Nemours & Co.

Heat-resistant paint composition comprising: boric acid, a lead compound capable of reacting with boric acid to form a lead borate, and methyl silicone resin. 2,495,306. Paul Zurcher.

Treating a sugar solution that has been decolorized with active chlorine, by contacting with a thermally activated bauxite. 2,495,334. Porocel Corp.

Stiffening impregnant for paper-board containing white paraffin, limed rosin, opal wax, and carnauba wax. 2,495,575. Universal Match Corp.

Diamond abrasive article comprising diamond grains in unswelled vitrified bond structure that comprises pre-fired lead borosilicate glass. 2,495,606. Norton Co.

Diamond abrasive article comprising diamond grains in unswelled vitrified bond structure that comprises pre-fired lead silicate glass. 2,495,607. Norton Co.

Liquid for removal of dried paint, varnishes and adhesives from coated surfaces, comprising cellulose acetate, acetone, paraffin wax, a surface active agent soluble in the solvent, comprising the dioctyl ester of sodium sulfosuccinic acid, benzene, tetramethylene oxide and ethyl acetate. 2,495,728. Celanese Corp. of America.

Removal of dried paint, varnishes and adhesives from coated surfaces, by applying a mixture of cellulose acetate in acetone, paraffin wax, carbon tetrachloride, ethylene dichloride, a substantially equal mixture of propyl alcohol and butyl alcohol and ethyl acetate, removing the softened paint, varnish or adhesive with the cellulose acetate film formed thereon, applying a wash coat comprising a solution of film forming cellulose acetate in acetone, ethylene dichloride, a substantially equal mixture of propyl alcohol and butyl alcohol, titanium oxide and carbon disulphide, and removing the traces of the paint, varnish or adhesive. 2,495,729. Celanese Corp. of America.

Cork composition comprising compressed cork granules, glycerine and the heat reaction product of glue, resorcinol and paraformaldehyde. 2,495,759. Armstrong Cork Co.

Preventing corrosion of metals exposed to brines containing corrosive sulfur compounds by incorporating in the brine melamine. 2,496,354. Cities Service Oil Co.

Preventing the corrosion of metals when exposed to oil well brine containing sulfur compounds by incorporating formaldehyde and ammonia. 2,496,594. Cities Service Oil Co.

Corrosion inhibiting composition for inhibiting the corrosive action of oil well products containing hydrogen sulfide comprising an aqueous solution of formaldehyde and hexamine. 2,496,595. Cities Service Oil Co.

Protecting metal equipment subject to the corrosive action of oil well products containing hydrogen sulfide, by treating with an aqueous solution of formaldehyde and amino-reactive compound, selected from the group consisting of alkylamines, alkanol amines, aryl amines, alkylamino phenols, alkyl amino phenylene diamines, heterocyclic amines, and ureas. 2,496,596. Cities Service Oil Co.

Forming a stable aqueous dispersion of solid, highly chlorinated, paraffin by combining with a dispersing agent comprising polyvinyl alcohol and subjecting said mixture to milling. 2,496,745. Diamond Alkali Co.

Nondrying adhesive which comprises a sticky, stretchable polyester of a dihydric alcohol with a dimer of a fatty acid which contains at least two double bonds with resinous cyclized rubber. 2,496,934. Wingfoot Corp.

Toilet bowl cleaner consisting of sodium acid sulphate, sodium bicarbonate, and a normally solid water soluble organic stabilizer. 2,497,057. John W. Pape and George S. Santmyers.

Textiles

Production of insolubilized filamentary products by the wet spinning of protein solutions. 2,495,566. Imperial Chemical Industries Ltd.

Artificial fiber comprising a filament of a polyvalent metal salt of a pectinic acid. 2,495,757. U. S. A. as represented by the Secretary of Agriculture.

Preparation of fibers from carboxymethylcellulose. 2,495,767. U. S. A. as represented by the Secretary of Agriculture.

Textile sizing composition comprising a water-sensitive hydroxylic polyvinyl resin; boric acid; a water-insoluble scourable wax which is incompatible with said resin and which consists of a compound selected from the class consisting of partial esters of neutral polyhydroxylic organic compounds with from 2 to 6 carbon atoms and saturated fatty acids with from 16 to 30 carbon atoms, diesters of hexides and saturated fatty acids with from 16 to 30 carbon atoms, water-insoluble esters of polyoxyalkylene ethers of neutral polyhydroxylic compounds with from 2 to 6 carbon atoms, and saturated fatty acids with from 16 to 30 carbon atoms, and water-insoluble polyoxyalkylene ethers of partial esters of neutral polyhydroxylic organic compounds with from 2 to 6 carbon atoms, and saturated fatty acids with from 16 to 30 carbon atoms; and a nonionic water-soluble emulsifier. 2,495,845. Atlas Powder Co.

Wool treating composition which comprises a nonresinifying oil and a liquid monoacylated organic fatty ester to soften and lubricate wool fibers and a condensation product formed by heating a fatty acylating substance having an acyl chain of at least 8 carbon atoms with an alkylolamine. 2,496,631. Nopco Chemical Co.

Textile yarns impregnated with a lubricant containing an acetoacetylamide. 2,496,776. Eastman Kodak Co.

*Agricultural**

Liquid for forming a hard non-tacky insectidal film comprising 2,2-bis(p-chlorophenyl) 1,1,1-trichlorethane, a water insoluble cellulose ether, a resin selected from the group consisting of coumarine-indene resin, terpene resin, ester gum, polymerized ester gum, and maleicized ester gum, and a volatile solvent. 2,497,294. Foster D. Snell, Inc.

Preparing dust of slaked lime and a halophenoxycarboxylate weed killer. 2,497,636. Imperial Chemical Industries Ltd.

Resinous fungicidal agent comprising the product of copolymerizing an anhydride from the class consisting of maleic and chloromaleic anhydrides and an ether having the general formula, $Ar\text{-}(O\text{-}CH_2CR{=}CH_2)_n$, in which R represents a member of the class consisting of a methyl group and a hydrogen atom, n is a whole number having a value of one to two, and Ar is a chlorinated aromatic hydrocarbon radical of the benzene and naphthalene series containing 1 to 5 halogen atoms. 2,497,927. Rohm & Haas Co.

Prevention and destruction of weeds with an active herbicidal compound, from the group consisting of benzoyl-o-benzoic acid, 4'-chloro-2-benzoyl benzoic acid, 4'-methyl-2-benzoyl benzoic acid, and the water soluble salts of said acids and a non-phytocidal, dry, pulverulent solid which does not decrease the fertility of soil. 2,498,302. Imperial Chemical Industries Ltd.

Parasiticidal synergistic composition of benzene hexachloride and 2,4-dinitro-phenols. 2,499,396. Dow Chemical Co.

Insecticidal composition comprising equal parts of 1,1-di-(monochloropenyl)-ethane and di-(4-chlorophenoxy)-methane. 2,499,992. Dow Chemical Co.

Composition for use as a lousicide comprising a nicotine fluosilicate of a metal in period 3 of the Periodic Table of elements of the group consisting of zinc, copper, nickel and cobalt, and wettable sulfur. 2,500,-303. Allied Chemical & Dye Corp.

In the reaction of chloral or chloral hydrate with chloro benzene to form 2,2-bis(p-chlorophenyl)1,1,1-trichloroethane, the improvement which consists in carrying out the reaction in the presence of chlorosulfonic acid. 2,500,961. Walter H. C. Rueggeberg and Walter A. Cook.

N,N'-polythioamines as pesticides. 2,501,191. B. F. Goodrich Co.

*Cellulose**

Production of organic acid ester of cellulose wherein cellulose is esterified with a lower aliphatic acid anhydride employing an acid esterification catalyst. 2,498,,010. Celanese Corp. of America.

Insolubilizing an alkali-soluble cellulose ether formed by reacting alkali cellulose with isobutylene oxide and removing alkali by treating with a solution of a water-soluble cobalt salt and heating. 2,498,208. Rohm & Haas Co.

Thermoplastic composition of a matter consisting of cellulose proprionate plasticized with a plasticizer selected from the group consisting of di-butoxyethyl adipate and di-hexyloxyethyl adipate. 2,498,750. Celanese Corp. of America.

Preparation of alkali cellulose by passing a web of raw cellulose through a plurality of treating zones and spraying the web first with a lye solution of decreasing concentration. 2,499,010. American Enka Corp.

Making artificial filaments comprising cyanoethyl cellulose which comprises mixing viscose with acrylonitrile to effect reaction between the acrylonitrile and dissolved cellulose xanthate. 2,499,501. American Viscose Corp.

Thermoplastic composition of matter of improved electrical characteristics, comprising cellulose propionate containing as plasticizer therefor a non-polar hydrocarbon selected from the group consisting of mono-amyl naphthalene, di-amyl naphthalene and a mixture of partially hydrogenated isomeric terphenyls. 2,499,526. Celanese Corp. of America..

Forming cellulose ester filaments insoluble in acetone by reacting diketene with cellulose acetate dissolving the cellulose acetate-aceto-acetate thus formed, spinning and treating the filaments thus formed with an aqueous solution of formaldehyde in the presence of pyridine. 2,500,-029.. Eastman Kodak Co.

In treating cellulosic fibrous material wherein the fibers are wetted with an anion-active wetting agent, the improvement which comprises preliminarily treating the fibers with a substantially water-insoluble monooxy substituted hydrocarbon treating agent containing only carbon, hydrogen and oxygen in the molecule, selected from the group consisting of the aliphatic alcohols, aliphatic ketones and aliphatic aldehydes having 8 to 11 carbon atoms per molecule and mixtures of at least two members of the group to deposit a surface film of said treating agent before wetting of the fibrous material. 2,501,337. Shell Development Co.

*Ceramics**

Obtaining a uniform coloration in the copper-staining of a soda-lime-silicate glass. 2,498,003. Corning Glass Works.

Blue glass composed of SiO_2, B_2O_3, alkali metal oxide selected from the group consisting of K_2O, Na_2O, Li_2O and mixtures of a plurality thereof, Al_2O_3, cobalt oxide, and chlorine, said glass also containing a divalent metal oxide selected from the group consisting of BeO, CaO, ZnO, SrO, CdO, BaO, and PbO. 2,498,387. Corning Glass Works.

Refractory composition which consists of Cr_2O_3, TiO_2 and an alkaline earth metal oxide selected from the class consisting of MgO, CaO, SrO and BaO. 2,498,622. Corning Glass Works.

Producing glazed earthenware by applying to a ceramic support a frit of the composition: SiO_2, TiO_2, Al_2O_3, Na_2O, K_2O, CaO, BaO and ZnO. 2,498,912. Societe des Usines Chimiques Rhone-Poulenc.

Moldable heat hardenable matrix for making light weight refractory insulating brick consisting of finely divided bonding clay, kyanite and pyrophyllite. 2,499,229. Johns-Manville Corp.

Refractory composition for liming surfaces such as moulds and furnace walls, consisting of a powdered mixture of a comminuted dry refractory substance of the group consisting of silica (sand, quartz), siliceous graphite, china clay, Carborundum, zircon chromite and mixtures thereof and $Na_2SiO_3.9H_2O$. 2,499,729. Henri Jean Daussan..

Sintered composition for use as a mill addition opacifier for enamel frits which comprises zirconium oxide, aluminum oxide and phosphorous pentoxide. 2,500,231. National Lead Co.

*Coatings**

Resin-glyceride coating by reacting acid thermoplastic natural resin, fatty acid glyceride and pentaerythritol in the presence of a basic-reacting saponifying agent. 2,497,449. Falk & Co.

Improving the drying qualities of mixtures of tung oil with other drying oils by refluxing with acetic anhydride. 2,497,890. Interchemical Corp.

Improving the drying qualities of tung oil by refluxing the oil with acetic anhydride. 2,497,904. Interchemical Corp.

Sprayable, high solids coating composition in which the solids content comprises cellulose nitrate, polymerizable dimethacrylate esters of a mixture of glycols. 2,498,091. E. I. du Pont de Nemours & Co.

Paint comprising an aqueous colloidal dispersion of a polymer composed of a mixture of polymerizable unsaturated hydrocarbons, including monovinyl aromatic hydrocarbon of the benzene series and an aliphatic conjugated dioleline consisting of butadiene and isoprene, a pigment, an emulsifying agent and a protective colloid. 2,498,712. Dow Chemical Co.

Depositing an amorphous metal-phosphate coating on the surfaces of metals to prevent corrosion by subjecting a metallic surface composed of at least one of the group consisting of iron, copper, zinc, silver, and magnesium to the action of an aqueous solution containing a metal ion of at least one element selected from the group consisting of calcium, zinc, cobalt, magnesium, cadmium, iron, aluminum, barium, strontium, manganese, chromium, and nickel, a water-soluble alkali-metal phosphate glass and an oxidizing agent selected from the group consisting of water-soluble inorganic nitrates, nitrites, sulfites, permanganates, chromates, ferricyanides, dichromates, and perborates. 2,499,261. Harold I. Rosenbloom.

* From Vol. 631, Nos. 2, 3, 4; Vol. 632, Nos. 1, 2, 3.

Hard film corrosion preventive consisting of Gilsonite, petrolatum, lead stearate, amyl naphthalene, and petroleum distillate. 2,500,120.. Standard Oil Development Co.

Coating metal surfaces with a phosphate coating where said surfaces consist predominantly of aluminum by spraying on to said surfaces a solution containing acid phosphate and fluoborate and an oxidizing agent, maintaining the balance of the solution by adding a neutralizing sodum compound and acidic fluoride in amounts to combine with aluminum and form Na_3AlF_6 and remove excess aluminum. 2,500,673. Parker Rust Proof Co.

*Detergents**

Producing an improved rosin composition characterized by imparting an increased resistance to yellowing in soaps and sizes made therefrom, by heating a rosin material under non-oxidizing conditions with sulfur in the presence of an alkali metal to neutralize the rosin material to decrease the degree of unsaturation without aromatization of more than one ring of the rosin material. 2,497,882. Glidden Co.

Denture cleansing powder which comprises sodium percarbonate; an activating agent for enhancing the liberation of active oxygen and the bleaching action on the denture, comprising a stable, alkali-soluble compound of at least one member selected from the group consisting of aliphatic unsubstituted hydroxy-carboxylic acids containing up to 6 carbon atoms, the salts and the lactones of such acids with a metal which is capable of existing in at least two states of oxidation; the major proportion of the particles being coated with a least one member selected from the group consisting of palmitic acid, stearic acid, benzoic acid, ursolic acid, cholesterol and ethyl cellulose; and a buffer. 2,498,344. Lever Brothers Co.

Denture cleansing powder composition which comprises a per-oxy oxygen-liberating compound; an activating agent comprising a stable, alkali-soluble compound of at least one member selected from the group consisting of aliphatic unsubstituted hydroxy-carboxylic acids containing up to 6 carbon atoms, the salts and the lactones of such acids with a metal which is capable of existing in at least two states of oxidation, the major proportion of the particles being coated with at least one member selected from the group consisting of palmitic acid, stearic acid, benzoic acid, ursolic acid, cholesterol and ethyl cellulose; and a buffer. 2,498,344. Lever Brothers Co.

Aqueous detergent containing a mixture of longchain alkali alkyl aryl sulfonate containing from 9 to 18 carbon atoms in the alkyl chain with an alkali builder therefor, and a water-soluble polyether, alkylene selected from the group consisting of alkyl ethers of mono- and poly-alkylene glycols containing less than 5 carbon atoms stabilized against separation of a solid salt phase upon freezing by the addition of a water-soluble alkali polyalkyl benzene sulfonate derived from a liquid sulfur dioxide extract fraction of petroleum, by sulfonating said fraction and neutralizing the sulfonated product with an alkali. 2,500,024. California Research Corp.

*Dyes & Pigments**

Azo dyes. 2,497,246. General Aniline & Film Corp.

Contacting a polymeric nitrile with hydrazine until the dye receptivity is substantially increased. 2,497,526. E. I. du Pont de Nemours & Co.

Treatment of pigment comprising calcium carbonate. 2,498,005. Raffold Process Corp.

Daylight fluorescent pigment consisting of a dye exhibiting daylight fluorescence in dilute solution and a pulverized, transparent polymerized thermo-set resin carrier. 2,498,592. Joseph L. Switzer and Robert C. Switzer.

Complex salt of an aromatic light sensitive diazo compound and a sulfonated resin selected from the class consisting of sulfonated cumarone-indene resin, sulfonated polybenzyl resin, the formaldehyde condensation product of β-naphthalene sulfonic acid and the polymerized sodium salt of formaldehyde naphthalene sulfonic acid. 2,498,722. General Aniline & Film Corp.

Dyeing cellulosic material having free alcoholic hydroxyl groups by treating with a solution of a naphthyl ether, subsequently treating with a solution of a diazonium salt, and heating. 2,498,875. Rohm & Haas Co..

Monazo dyestuff. 2,499,133. Allied Chemicals & Dye Corp.

Anthraquinone acid dyestuffs. 2,499,431. General Aniline & Film Corp.

Dyeing nylon with dilute solutions of acid dyes. 2,499,787. E. I. du Pont de Nemours & Co.

Azo dyes formed from p-nitroanilines and 2-hydroxy-7-benzo-(c) carbazoles and their formation on the fiber. 2,499,800. E. I. du Pont de Nemours & Co.

Insolubilization of a soluble azoic dyestuff on the fiber. 2,500,080. Societe Anonyme de Matieres Colorantes et Produits Chimiques Francolor.

Textile printing paste comprising a diazoamino compound and a substituted benzothiazole. 2,500,093. Societe Anonyme de Matieres Colorantes et Produits Chimiques Francolor.

Azanol dyes. 2,500,111. General Aniline & Film Corp.

Preparing cyanine dye intermediates, a β-arylaminovinyl compound by condensing a quaternary salt with a diarylformamidine in the presence of an alkyl orthocarboxylate. 2,500,128. Eastman Kodak Co.

Making an improved sulfide pigment from an aqueous alkali-earth metal sulfide solution; cooling said solution to cause precipitation of alkali-earth metal hydroxide from said solution; separating part of said precipitate from its mother liquor; striking the resulting solution with an aqueous solution of a water-soluble salt of at least one metal selected from the group consisting of zinc and cadmium, to produce a sulfidic precipitate of the metal of said soluble salt and separating. 2,500,958. Glidden Co.

Anthrapyridone dyestuffs. 2,501,099. Celanese Corp. of America.

Dyeing keratinous fibres with dyes normally non-substantive thereto, by treating the fibre with dilute acetic acid having the characteristics of opening the fibre, and urea having the property of greatly swelling the keratin fibre and disrupting the secondary linkages thereof. 2,501,-184. Lawrence Richard Bruce, Inc.

Vat dyes of the antrimide carbazole acridone type. 2,501,645. General Aniline & Film Corp.

*Explosives**

Fuse compositions comprising a pulverulent mixture of potassium nitrate, red lead and silicon. 2,497,387. Imperial Chemical Industries, Ltd.

Thick-web powder grain comprising a colloided mixture of nitrocellulose and nitroglycerin, and a finely divided salt selected from the group consisting of potassium sulphate, potassium nitrate and barium nitrate. 2,498,388. U.S.A. as represented by the Secretary of War.

In making propellant powder treating a water suspension of a nitrocellulose-nitroglycerin mixture with a separately prepared dispersion of carbon black in a liquid dialkyl phthalate. 2,499,295. U.S.A. as represented by the Secretary of War.

Explosive composition comprising a mixture of granules of ammonium nitrate, granules of pentolite consisting of blended trinitrotoluene and pentaery-thritol tetranitrate, and starch nitrate. 2,499,321. Trojan Powder Co.

*Inorganic**

Preparing a manganese activated silicate phosphor selected from the group consisting of zinc orthosilicate, zinc beryllium silicate, magnesium orthosilicate, cadmium silicate and calcium silicate by disposing the components in the solid state, in an enclosed chamber; disposing at least one compound selected from the group consisting of $CdCl_2$,$ZnCl_2$, HgCl, $BbCl_2$, PbF_2, PbO, and PbO_2; and heating. 2,497,140. Sylvania Electric Products Inc..

Composition of matter comprising water, a water soluble alcohol, cerium acetate and an alcohol-soluble resin. 2,497,546. Curtis E. Griffin.

Production of magnesium nitride by reacting solid pyrophoric magnesium in the presence of hydrogen with nitrogen gas. 2,497,583. Permanente Metals Corp.

Recovering simultaneously high and low purity oxygen and krypton-xenon from the atmosphere by liquefaction and rectification. 2,497,589. Air Reduction Co., Inc.

Producing hydrogen peroxide by reacting a metal peroxide compound in aqueous medium with an acid-treated cation-exchange synthetic resin. 2,497,810. E. I. du Pont de Nemours & Co.

In manufacture and storage of a high-strength hydrogen peroxide solution the improvement which comprises adjusting and maintaining the pH of said solution not more than 1 pH unit above, nor more than 2 pH units below, the pH at which the greatest change in pH will occur on the addition of a substance from the group consisting of acid and base and adding thereto a hydrogen peroxide stabilizer. 2,497,-814. E. I. du Pont de Nemours & Co.

Concentrating fluorspar by froth flotation of pulps by subjecting such a pulp to froth-flotation treatment in the presence of a soluble inorganic fluoride, at least one processed starch product selected from the group consisting of gelatinized starch, and dextrinized starch, and in the concurrent presence of at least one collecting agent selected from the group consisting of higher fatty acids and soaps, whereby the fluorspar values are floated and recovered. No. 2,497,863. U. S. A. as represented by the Secretary of Interior.

Purifying alkaline earth metal and magnesium fluorides by heating with a small amount of lead fluoride to react the lead fluoride with said impurity to form a volatile reaction product. No. 2,498,186. Research Corp.

Making magnesium silicate of high decolorizing capacity by mixing an aqueous solution of sodium silicate with a precipitant selected from the group consisting of a water soluble mineral acid and an alkali metal salt of a mineral acid, heating until an insoluble precipitate begins to form, then adding a water soluble magnesium salt, and continuing the heating until magnesium silicate is formed. No. 2,498,353. Ernest C. Bierce.

Production of a catalyst having aromatizing properties by impregnating an activated alumina with a nitrate of a metal selected from the group consisting of zinc and copper, calcining, then impregnating with ammonium molybdate, and converting the impregnated molybdenum to molybdenum oxide. No. 2,498,709. Shell Development Co.

Production of lime from calcium carbonate which is in a fluidized state. No. 2,498,710. Standard Oil Development Co.

Making an emulsifying agent by preparing an alkaline dispersion of clay in water and adding an aluminum salt in the presence of sufficient alkaline material to precipitate the aluminum as a hydrated gelatinous precipitate. No. 2,499,002. Lancaster Processes, Inc.

Fluorescent material consisting of lead-activated barium silicate. No. 2,499,307. Sylvania Electric Products, Inc.

Production of phosphoric acid and hydrogen by mixing superheated steam and phosphorus vapor; passing the resulting mixture over a catalyst comprising a material selected from the group consisting of copper, copper phosphide, platinum, and the platinum phosphides supported on a material selected from the group consisting of aluminum orthophosphate, aluminum metaphosphate, aluminum phosphide, and mixtures thereof. No. 2,499 374. Tennessee Valley Authority.

Defluorinating phosphate rock. No. 2,499,385. Tennessee Valley Authority.

Oxidation of phosphorus with steam. No. 2,499,424. Tennessee Valley Authority.

Making a pelleted chromia-alumina catalyst by calcining hydrated alumina, finely grinding the resulting material, incorporating a minor proportion of chromic oxide prior to completion of said grinding step, compressing the resulting finely ground material into pellets and calcining said pellets. No. 2,499,675. Phillips Petroleum Co.

Defluorination of phosphate rock by calcination in the presence of water vapor. No. 2,499,767. Coronet Phosphate Co.

Preparation of uranium hexachloride by reacting an oxide of uranium with a gaseous mixture of chlorine and carbon tetrachloride. No. 2,499,-836. U.S.A. as represented by the U.S. Atomic Energy Commission.

Synthesis of ammonia from its constituent elements which comprises subjecting a mixture of nitrogen and hydrogen carrying a finely divided catalyst in suspension to ultrasonic vibrations. No. 2,500,008. Mathieson Chemical Corp.

Electrolytic method of preparing manganese dioxide from an ammoniacal slurry of manganese hydroxide. No. 2,500,039. Eastman Kodak Co.

Selectively absorbing ammonia from gases containing the same, by passing the ammonia-containing gas through an absorbent liquid composed of an aqueous solution of a mineral acid salt of an aromatic base. No. 2,500,291. Carnegie-Illinois Steel Corp.

Process of making a finely divided iron catalyst containing promoter selected from the class consisting of alkali and alkaline earth metal compounds by classifying the finely divided iron catalyst into relatively fine and relatively coarse particles, applying a relatively dilute solution of promoter to the surface of the relatively fine catalyst particles, applying a relatively strong solution of promoter to the surface of the relatively coarse catalyst particles, drying the two sizes of promoted catalyst, and recombining to produce a fluidizable mixture. No. 2,500,-331. Standard Oil Co.

Treating clay containing contaminating soluble salts, by contacting an aqueous suspension of clay with an anion exchanger in its OH form and with a cation exchanger in its hydrogen form, and separating said exchangers from the clay suspensions. No. 2,500,727. Georgia Kaolin Co.

Production of potassium fluozirconates having $KF:ZrF_4$ molecular ratios by reacting together potassium chloride and an aqueous hydrofluoric acid solution of zirconium fluoride. No. 2,500,792. Magnesium Elektron Ltd.

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* From Vol. 631, Nos. 2, 3, 4; Vol. 632, Nos. 1, 2, 3.

Producing anhydrous ammonia from strong ammonia liquor. No. 2,501,326. Frigid Transport Co., Inc.

*Leather**

Preparing tanning liquors by reducing a solution of an alkali metal dichromate with sulfur dioxide, reducing another solution of an alkali metal dichromate with sugar in the presence of sulfuric acid, and mixing the two solutions. No. 2,500,020. Virginia Smelting Co.

*Metals**

Flux for treatment of magnesium and magnesium base alloys consisting of one halide selected from the group consisting of the chlorides and fluorides of barium and strontium. No. 2,497,538. Magnesium Elektron Ltd.

Flux for treating magnesium alloys containing zirconium which consists of magnesium chloride, at least one chloride from the class consisting of sodium chloride and potassium chloride, and at least one chloride of the class consisting of barium chloride and strontium chloride. No. 2,497,539. Magnesium Elektron Ltd.

Flux for treatment of magnesium alloys containing a rare earth metal, which flux is substantially free from magnesium chloride and consists of at least two chlorides of the alkali metals and alkaline earth metals. No. 2,497,540. Magnesium Elektron Ltd.

Minimizing "patchiness" in etched chromium electrodeposits. No. 2,497,591. United Chromium, Inc.

Recovery of manganese by electrolysis of a solution of manganese and ammonium sulfates, and including in the catholyte an organic smoothing agent of the group of organic acids consisting of adipic, aspartic, azelaic, glutamic, glutaric, maleic, malonic, phthalic, and succinic acids. No. 2,497,725. New Jersey Zinc Co.

Bath for plating bright cadmium consisting of an aqueous cadmium cyanide solution containing alkali metal cyanide and a roasted water extract of coffee to impart a bright surface to cadmium deposited. No. 2,497,806. Lea Mfg. Co.

Forming a visible corrosion resistant coating on a surface of zinc or cadmium by subjecting the same to an aqueous acidic solution consisting of a compound selected from the group consisting of chromic acid and soluble salts thereof; a compound selected from the group consisting of phosphoric acid and soluble salts thereof; a compound selected from the group consisting of nitric acid and soluble salts thereof and a compound selected from the group consisting of sulfuric acid and soluble salts thereof until a green coating is formed. No. 2,497,905. Rheem Mfg. Co.

Indium plating from an aqueous indium cyanide dextrose electrolytic bath. No. 2,497,988. Vandervell Products Ltd.

In brazing light metal alloys, the improvement comprising cleaning the surface by applying a brazing flux consisting of alkali metal halides, alkaline earth metal halides and a substance selected from the group consisting of silicon halides and silicon hydrides. No. 2,498,199. Garrett Corp.

Tinning a steel shell bearing by applying a thin coating of a methyl and phenyl-substituted polysiloxane, heating to advance the resinous coating to the infusible and insoluble state, placing the bearing in an acid pickling bath and then in a flux bath comprising water and zinc chloride, and dipping in a molten tinning bath. No. 2,498,485. General Electric Co.

Pickling an article of magnesium or magnesium-base alloys by immersing in an aqueous solution of aluminum chloride. No. 2,499,269. Dow Chemical Co.

Flux for brazing and hard soldering consisting of the fusion product of an alkali metallic fluoborate, the remainder consisting of an alkali borate, boric acid and an alkali carbonate. No. 2,499,641. Monroe Sherman.

Plating metallic molybdenum from an electrolyte comprising an aqueous solution of a compound of the class consisting of molybdic acid, its anhydride and its salts and anion of an aliphatic acid of the class consisting of formate, acetate and propionate. No. 2,499,807. President and board of trustees of St. Louis University.

Electrolyte for the electrodeposition of molybdenum comprising an aqueous solution of a molybdate compound and a concentration of fluoride ion. No. 2,499,808. President and borad of trustees of St. Louis University.

Fluidizer for maintaining localized fluidity of molten metal comprising Al_2O_3, KNO_3, $NaNO_3$, Fe_2O_3, FeO, Na_2O, CaF_2, KF, AlF_3, TiO_2, SiO_2, NH_4NO_3, NaF, $NaHF_2$, Al and Mg. No. 2,500,097. Peter J. Soffel.

Production of metallic iron from iron oxides. No. 2,501,189. Robert D. Pike.

Concentrating sulphide ore by froth flotation in the presence of X-CO-Y-CO-X in which X is an organic dithio acid radical of the group consisting of alkyl xanthate radcals and alkyl dithiophosphate radicals and Y is an organic radical of the group consisting of radicals, $O\text{-}C_2H_4\text{-}O$ and $O\text{-}C_2H_4\text{-}O\text{-}C_2H_4\text{-}O$. No. 2,501,269. Minerec Corp.

*Organic**

3,5-dihalogen-2-cyanodiphenyls. No. 2,497,060. General Aniline & Film Corp.

Production of alkali metal phytates by reaction between a metal phytate precipitate comprising a material selected from the group consisting of calcium phytate, magnesium phytate and mixtures thereof, and an alkali metal hydroxide in a water medium, and recovering alkali metal phytate. No. 2,497,062. Corn Products Refining Co.

Mixing a magnesium phytate precipitate obtained from the treatment of corn steep liquor with magnesium hydroxide, with an alkali metal hydroxide to effect a chemical reaction between said magnesium phytate and said alkali metal hydroxide. No. 2,497,063. Corn Products Refining Co.

Inhibiting the evolution of hydrogen sulfide from a sulfurized oleaginous compound by adding a quinone. No. 2 497,097. Standard Oil Co.

Producing a mercapto alkoxy thio-ether by reacting an alkoxy thiol containing from 4 to 18 carbon atoms per molecule, with an olefin sulfide containing from 2 to 9 carbon atoms per molecule, and recovering a resulting mercapto alkoxy thio-ether. No. 2,497,100. Phillips Petroleum Co.

Producing a diaroyl-diamino-stilbene-disulfonate by refluxing in a water-immiscible, inert, organic liqud, 4,4'-damino-disulfo-stilbene, a monocyclic aroyl chloride, and diethyl-cyclohexylamine. No. 2,497,130. E. I. du Pont de Nemours & Co.

In producing a diaroyl-diamino-stilbene-disulfonate, the step which consists of bringing together into reactive contact a 4,4'-diamino-2,2'-disulfostilbene, a monocyclic aromatic carboxylic acid, and an acid halogenating agent selected from the group consisting of phosphorous oxychloride, phosphorus trichloride and thionyl chloride, in the presence of a tertiary base selected from the group consisting of dimethyl-cyclohexylamine, diethyl-cyclohexylamine, tributylamine, quinoline and pyridine. No. 2,497,131. E. I. du Pont de Nemours & Co.

Dechlorinating sulfurized diisobutylene obtained by reacting diisobutylene with sulfur monochloride by heating with 2-ethylhexyl alcohol. No. 2,497,138. Standard Oil Development Co.

Substituted gamma-2-thenoyl-butyric acid. No. 2,497,145. E. I. du Pont de Nemours & Co.

Separating the mixture of hydrocarbons containing a normal pentene and branched pentenes by contacting with a solution of cuprous salt in an organic nitrogen base. No. 2,497,159. Standard Oil Development Co.

Preparation of 2(para-aminobenzenesulphonamido)-pyrimidine by reacting a para-acylaminobenzene-sulphonylguanidine with the diethyl acetal of propinal and then subjecting the resulting reaction product to a deacylation treatment. No. 2,497,163. Societe des Usines Chimiques Rhone-Poulene.

Production of pure isobutylene from an isobutylene fraction containing isomeric butene-1 and butenes-2 by contacting with sulfuric acid. No. 2,497,191. Standard Oil Development Co.

In dealkylating an alkoxy aromatic amine by heating in the presence of a inert liquid diluent with aluminum chloride or alumnium bromide. No. 2,497,248. General Aniline & Film Corp.

N-isobutyl hexamethylenediamines. No. 2,497,292. E. I. du Pont de Nemours & Co.

Purification of ethylene containnig acetylene as an impurity by passing the said ethylene through a dispersion of metallic sodium in a liquid hydrocarbon medium to which has been added anthracene to prevent the formation of foam. No. 2,497,296. E. I. du Pont de Nemours & Co.

Preparation of oxygen-containing organic compounds by reacting an organic unsaturated compound containnig olefinic unsaturation simultaneously with carbon monoxide and hydrogen in the presence of a carbonyl of a metal. No. 2,497,303. E. I. du Pont de Nemours & Co.

Synthesis of carboxylic acid anhydrides by reacting under anhydrous conditions a carboxylic acid of the formula RCOOH, R being an alkyl group, with a hydrocarbon containing non-aromatic monoolefinic unsaturation, and carbon monoxide in the presence of a nickel-containing catalyst of the class consisting of nickel carbonyl. No. 2,497,304. E. I. du Pont de Nemuors & Co.

Preparation of ethyl-eneurea by subjecting carbon dioxide and ethylene diamine to reaction. No. 2,497,308. E. I. du Pont de Nemours & Co.

Continuous cyclical process for the preparation of ethyleneurea from ethylenediamine, water, and carbon dioxide. No. 2,497,309. E. I. du Pont de Nemours & Co.

Synthesis of amines by introducing carbon monoxide, hydrogen, a compound of the class consisting of ammonia and amines having at least one hydrogen attached to amino nitrogen, an unsaturated hydrocarbon compound containing a non-benzenoid double bond and a catalytic quantity of cobalt metal. No. 2,497,310. E. I. du Pont de Nemours & Co.

(5-chloro-2-thenoyl)-o-benzoic acid. No. 2,497,311. E. I. du Pont de Nemours & Co.

2-chlorothiophanthraquinone. No. 2,497,312. E. I. du Pont de Nemours & Co.

Thiophanthraquinone by heating phthalic anhydride and thiophene in nitrobenzene in the presence of aluminum chloride. No. 2,497,334. E. I. du Pont de Nemours & Co.

Salts and free-base form of 2-aryl-amino-4-substituted quinolines. No. 2,497,347. Imperial Chemical Industries, Ltd.

Production of an alicyclic alcohol by oxidizing a saturated cyclic hydrocarbon having from 4 to 8 carbon atoms per molecule with a gas containing free oxygen to produce the hydroperoxide of said cyclic hydrocarbon and reducing said hydroperoxide to an alicyclic alcohol having the same carbon skeleton. No. 2,497,349. Union Oil Co. of Calif.

Alkylaminoalkyl benzoates. No. 2,497,394. Sharp & Dohme, Inc.

Preparation of propylene glycol monoacetate and propylene glycol diacetate by acting on acetic acid and propylene with an oxidizing gas in the presence of a mixed catalyst of an acetate of an alkaline earth and of an acetate of a heavy metal of the group consisting of lead and ferric iron. No. 2,497,408. E. I. du Pont de Nemours & Co.

Producing an alkoxy thiol by reacting a glycol mono-ether containing not more than nine carbon atoms in the molecule with an olefin sulfide containing from 2 to 9 carbon atoms. No. 2,497,422. Phillips Petroleum Co.

Alkyl esters of glycol polycarboxylic acid esters. No. 2,497,433. Monsanto Chemical Co.

1-acetyl-2-methyl-2-chloro-methylcyclopropane. No. 2,497,483. U. S. Rubber Co.

In preparing phenols having unsaturated substituents by condensing phenol in the presence of an acid catalyst with a ketone of the class consisting of cyclohexanone and alkyl methyl ketones, heating to produce a phenol having an unsaturated substituent and distilling off the substituted phenol, the step of, prior to pyrolyzing, adding to the condensation product a strong alkali metal base in excess of the equivalent of the acid catalyst remaining in the condensation product. No. 2,497,503. Libbey-Owens-Ford Glass Co.

Preparation of an amino alcohol by reacting with hydrogen a mixture of a 1,3-diazine reactant and water. No. 2,497,548. Shell Development Co.

Hydroxyaliphatic monoamine having attached to the nitrogen atom not more than 3 radicals consisting of from 1 to 2 3-buten-2-ol radicals and from 1 to 2 2-hydroxyalkyl radicals. No. 2,497,553. Dow Chemical Co.

Purifying ether by reacting ether containing aldehyde with a substance selected from the group consisting of hydroxylamine and water-soluble salts thereof. No. 2,497,601. Les Usines de Melle (Societe Anonyme)

Reaction of alpha-beta unsaturated compounds with aromatic hydrocarbons. No. 2,497,673. E. I. du Pont de Nemours & Co.

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Calcium salt of 2-methyl-3,4-dihydroxy-5-phosphonoxymethylpyridine. 2,497,732. Merck & Co., Inc.

Separation of 2,2-diphenyl-4-dimethylaminovaleronitrile and 2,2-diphenyl-3-methyl-4-dimethyl-aminobutyronitrile by precipitating 2,2-diphenyl-3-methyl-4-dimethylamino-butyronitrile by the addition of p-toluenesulfonic acid. 2,497,739. Merck & Co., Inc.

Production of 1,5-pentanediol by hydrogenating di-2-tetrahydropyryl ether in a neutral aqueous medium. 2,497,812. E. I. du Pont de Nemours & Co.

* From Vol. 631, Nos. 2, 3, 4; Vol. 632, Nos. 1, 2, 3.

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Mixers

(Continued from page 921)

essing for continuously making syrups, mayonnaise, marshmallows, and so forth; it is claimed they can be used for compounding rubber continuously, and to require very much less power than the Banbury mixers now used.

The current picture of blenders is one of a wide variety of types, some as old as the hills, some developed yesterday. Undoubtedly, massive slow-moving paddles and gates, ribbon blenders, heavy-duty kneaders, and tumbling cones will continue to be widely used; undoubtedly, also, many of them will be replaced by some of the newer machines. The trend seems to be toward small continuous units which work intensively for a few seconds on a small quantity of material; with many products this gives better mixing and requires less power than does stirring or kneading a large batch all at once.

The use of vacuum and of superatmospheric pressures is also increasing. High pressures are especially useful when solids and gases are to be reacted, and many mixers for dry solids make admirable gas-solid reactors. Some products, especially fine, light powders, can be mixed more effectively under vacuum than at atmospheric pressure. The vacuum removes adsorbed gas from the solid particles, and eliminates or greatly reduces the formation of balls and lumps.

The mixing of liquids, to some extent, is becoming a science; the blending of pastes and powders is still almost completely an art. Except by testing the material in a laboratory or full-size model, there is no way of being sure a given blender will work successfully on a given product. However, from long experience the mixer manufacturers can often make a good guess from inspection of a sample. They are more than willing to conduct tests, usually free of charge; in the selection of a blender their recommendations are invaluable. Most mixing problems have already been solved by the mixer companies, and new ones can be solved much more easily if intelligent use is made of their knowledge and experience.

ACKNOWLEDGMENT

The author is indebted to the many mixing companies for their generous cooperation and assistance in supplying information for this report.

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(Continued from page 835)

Molten phthalic is not corrosive to equipment. Moreover, should some accidental steam leakage take place in distribution, it is not too likely that serious damage to equipment will occur as phthalic acid in amounts up to 5% is pumpable and not excessively corrosive.

Storage tanks should be jacketed and insulated. The jacketing need not extend over the top of the tank. A jacket covering approximately one-third of the tank area is satisfactory for a horizontal tank if it accommodates steam at 100 lb./sq. in.

The surface of the stored phthalic must not be allowed to remain solid without a pressure release area while the content of the storage tank is being melted. This pressure release is easily accomplished by running the steam pipe that heats the jacket down the outside of the tank, thus melting a vertical channel from top to bottom along the length of the pipe. Storage tanks may be fitted with a temperature-reading device and depth gauge which is purged with an inert gas or dry air. However, "dip-stick" or other measuring methods are satisfactory.

Some users blanket the storage tank with an inert gas. If the gas is available, this practice may be followed as a precautionary measure but it is not essential either for safety or for preserving the quality of the material. Storage tanks should be provided with vents that are steam-jacketed to prevent clogging with phthalic sublimate. The pipe leading from the storage tank to the processing point should have a 1% or greater slope running back into the tank for good drainage when idle.

Submerged pumps are best for the distribution systems because stuffing box problems are materially reduced. For unloading tank cars, an external pump is more satisfactory than air or inert gas pressure on the car. Unloading pumps should be steam heated or jacketed and self-priming. High-temperature graphitized asbestos is satisfactory for packing material.

TRANSFERRING EQUIPMENT

Since the solidification point of phthalic anhydride is 131° C., all pipe and equipment used for distribution must be steam jacketed and insulated. The equipment assigned to transferring molten phthalic requires no special materials of construction. Iron pipe and steel (or semi-steel) jacketed cocks are satisfactory. Ordinary asbestos-base gaskets are used. At Monsanto, jacketed seamless iron pipe has carried molten phthalic for fifteen years and to date there is no noticeable sign of corrosion. The jackets on the distribution lines with 1" pipe jumpers at flanges should have steam traps at intervals of about 250 feet.

For internal transferring, seamless pipe and butt-welded joints rather than flanged fittings are recommended. Steam jacketed plug cocks are more satisfactory than ordinary valves wrapped with steam tracing.

To prevent accidents that might result from setting cocks in distribution lines incorrectly, Monsanto uses electrical interlocks with mechanical linkages to the various cocks.

Handling of molten phthalic anhydride presents no great safety hazards. Actually the danger to workmen from vapor and dust are less than when the material is handled as a flaked solid. Sparks and open flames must be avoided around tank cars and storage tanks, and the normal precautions against burns must be taken.

TEMPERATURE REGULATION

Since the flash point of phthalic anhydride is about 155° C., storage tank temperatures should be regulated not to exceed 150° C.

The color of phthalic anhydride is not noticeably affected at temperatures of 140-150° C., even in iron storage tanks, provided the material meets certain purity standards. Prolonged storage at temperatures above 150° C., however, will tend to cause darkening.

In Monsanto's experience, it has been found that molten phthalic can be stored for a month or more at 150° C. with no appreciable color pick-up. Close temperature control is one of the two key factors in preventing color change; the other is the precautionary measures taken to prevent contamination of the product while in storage. With a melting point of 131° C., it is obvious that molten phthalic can be stored and pumped at temperatures well below 150° C., the point at which significant color changes begin to occur.

To sum up, the advantages of handling phthalic anhydride in liquid form are: lower material cost, lower handling cost at point of use, elimination of dust encountered in flake handling, improved processing reaction time, better control over handling operations, and savings in storage space.

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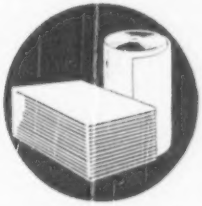

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